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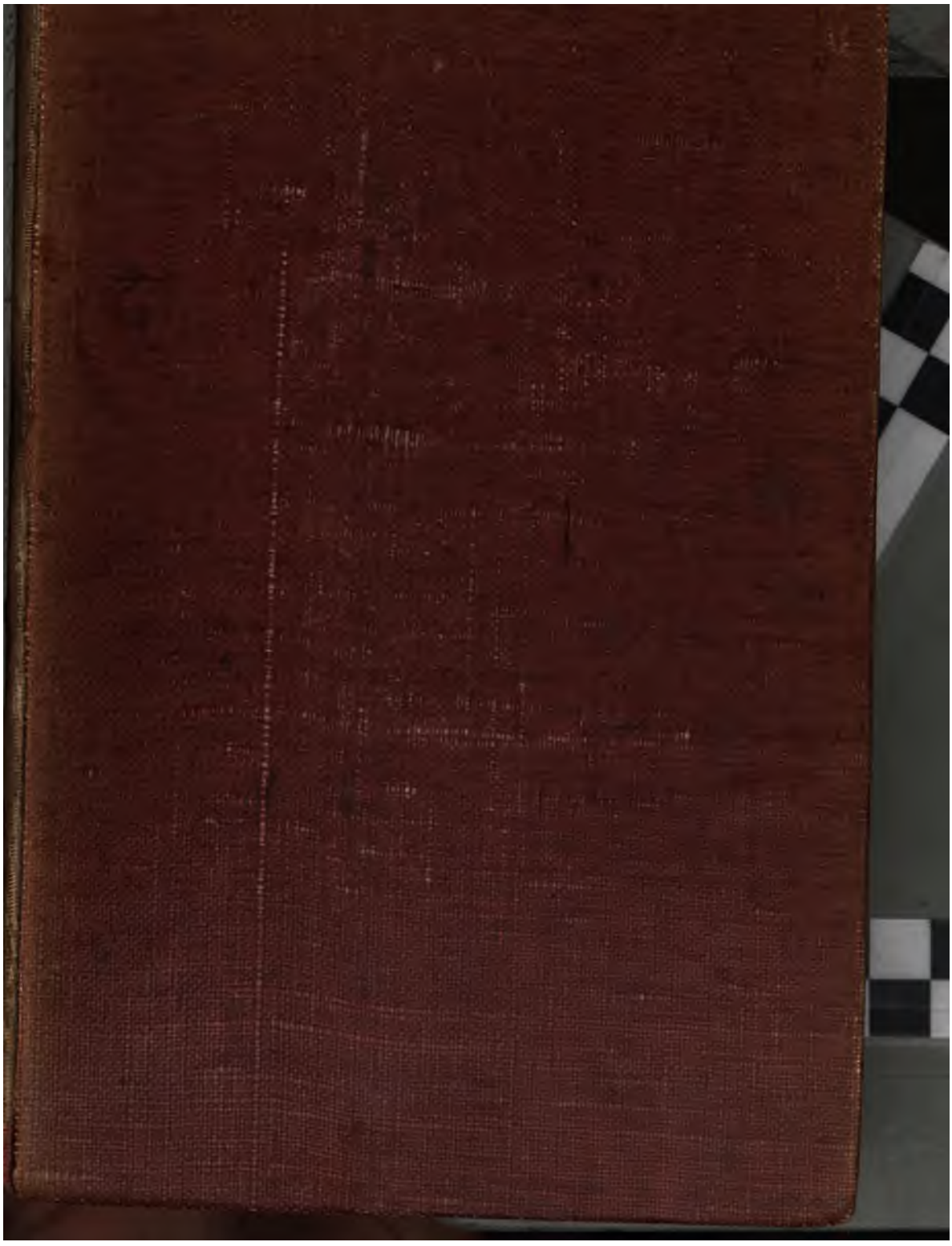

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CONCHOLOGY.

THE LAND SHELLS OF GIBRALTAR.*

By Dr. W. KOBELT.

[Read before the Conchological Society.]

The rock of Gibraltar, on account of its favourable position between Spain and Marocco, is one of the specially interesting localities for the conchologist. The investigation of the molluscous fauna on the columns of Hercules is of the greatest importance with regard to the question as to the former connexion between Europe and Africa, and on the north side of the Straits the rock of Gibraltar is the only spot at all favourable to the development of land shells. I was collecting there for several days in May, 1881, and have been able to obtain a large number of interesting molluscs, upon which I make the following brief report. However, I hardly venture to hope that my results are absolutely complete. Having been but once in Gibraltar I could only gather those specimens which survived the winter, and very young ones which had made their appearance before the month of May. For this reason I found one beautiful *Xerophile*, only in a very immature condition, also a probably new *Hyalina*, *H. Coquandi*

* Translated from the original by Mr. R. Scharff, Edinburgh University.

only dead or quite young specimens, and *Fruticolæ* none at all. It is necessary to collect in such places at different seasons in order to get the fauna completely. Besides this circumstance, collecting in Gibraltar is connected with considerable difficulties. The gardens covering the foot of the rocks on the western side are practically inaccessible to the stranger who only stops a short time and makes no acquaintances. In the surroundings of the fortifications on the other hand the sentries prevent people from straying beyond the foot-paths or from lifting up a stone. In many of these parts it is only possible to collect clandestinely. A British subject might easily procure a permission from the authorities to pursue his researches, and might in all probability discover still other species.

I should like to draw the attention of any one who would care to take up his quarters at Gibraltar, to the opposite Monkey-Mount in Marocco, which has not yet been examined, as it no doubt offers an equally interesting fauna. Hunting parties frequently make excursions to the opposite shore, and it might in this way not be difficult to visit this mountain. The territory lying between this mountain and Tetuan, called the "Sierra Bullones," still awaits the explorer. The beautiful *Helix Sultana* Mor., or some species allied to it, and specimens of the subgenus *Anchistoma* might be found there, which would fully compensate the trouble. On the chalk hills between Gibraltar and Ronda also, nobody has as yet collected. The sea fauna of the bay of Gibraltar being likewise very rich and comprising many peculiar species (I found there among others, *Panopæa Aldrovandii*, *Mytilus perna*, *Ungulina rubra*, *Mathilda quadricarinata*, remarkably fine specimens, *Mesalia varia*, a beautiful and perhaps new *Turritella*, *Natica filosa*, *Fusus longurio*, *Cassidaria tyrrhena*, &c.) I can warmly recommend Gibraltar to the conchologist as a winter residence.

The fauna of Gibraltar is very peculiar, many characteristic species of the Mediterranean shores being here wanting. The genus *Leucochroa* for instance, is represented neither in Gibraltar

nor in Marocco. It is the same *Cyclostomæ* and *Pomatias* which are wanting on both sides of the Straits (only near Tetuan I found, strange to say, our *Cyclostoma elegans*). I further failed to discover *Helix vermiculata*, *H. variabilis*, *H. profuga*, *H. pyramidata*, *H. aperta*, *Clausilia bidens*, *Bulimus pupa* and many others common in other localities.

I collected the following specimens :—

1. **Parmacella calyculata** Sowerby?

Only a few specimens under stones on the crest of the rock. This species deviates considerably as regards color from *Deshayesii* Moq. of Oran. Unfortunately the only living specimen I collected died before I was able to write a more accurate description of it. The *Limax* differs from the *P. dorsalis* Mousson (Icon., fig. 1318), to which I might refer those specimens collected by me at Tangier by its considerably smaller embryonic shell and thickness, by its flatter shape and greater width. The dimensions are: long 17, lat. 12 mill. *P. Deshayesii* has in smaller specimens nevertheless larger embryonic whorls. A *Limax* collected by Rossmässler in 1853 between Malaga and Velez Malaga, agrees in its embryonic whorls with the one of Gibraltar, it is however narrower and more solid.

2. **Hyalina Draparnaldi** Beck. var.

Not very rare, especially in the churchyard among the ivy covering the old town wall; in all probability it may also be found in other damp places. The above reminds me at first of var. *Blauneri* Shuttl., and has like it narrower whorls than the type and six of them altogether, the stripes however are less distinct and the last whorl is not quite so compressed.

3. **Hyalina calpica** n. sp.

Testa mediocriter sed pervie umbilicata, depressa, superne sub lente tantum, interne vix striatula, tenuis,

pellucida, nitens, cornea, spira vix elevata, sutura distincta; aufractus 5 convexiusculi, ultimus depressus, basi subplanatus, apertura lunato-ovata, peristomati simplici margine basali parum arcuato.

Diam. maj. 10; min. 8. Alt. vix. 4 mill.

Shell thin, almost cylindrical, umbilic passing right to the apex, but only showing very little of the second whorl, depressed, striations on the top distinctly visible by the lens, while underneath the shell is smooth, tolerably transparent, glossy and horn-colored. The shell is only slightly elevated with a distinct and deep suture. The five whorls are somewhat arched and increase regularly, the last one only a little expanded, depressed, flattened at the base and almost obtusely angular. The aperture is oval in shape, pretty much rounded off, the peristome is simple and thin, the basal margin almost horizontal. This species resembles the Sardinian *Hyalina opaca* Shuttl. (Icon., fig. 1619), but it is smaller, the last whorl not so distinctly angular and the striation fainter.

4. **Hyalina Dauthezi** n. sp.

Testa mediocriter umbilicata, depressa, superne plana vel leviter concava, intra convexa, ferè planorbiformis, distincte striata, supra olivaceo-cornea, infra albida, sat solida; spira parva, subimmersa, apice minimo. Anfractus 5, sutura impressa distincte marginata discreti, superi lente inflatus basi convexus; apertura rotundato-ovata fere verticales valde lunata, peristomati simplici, regulariter arcuato.

Diam. maj. 10; min. 8. Alt. 4. mill. Apert. 5 mill. lat. 4 mill. alta.

Only two specimens of this highly interesting planorbis-shaped form lie before me, which are perhaps not fully developed, according to my friend Boettger,

to whose inspection I submitted my *Hyalinæ*. I nevertheless felt inclined to describe them as new, on account of the peculiar shape, the very small apex and the disproportionately large last whorl which characterize them unmistakably. I also believe that very little is wanting of the full growth, or else the last whorl would not increase so rapidly. The only species with which *Hyalina Dauthezi* might be compared is *Hyalina Djurdjurensis* Debeaux, the latter however has a diameter of 16 mill., and it was distinctly described as having a flat suture without a margin.

I name this species in honor of Mr. G. Dauthez, Engineer at Gibraltar, who has chosen the natural history of the rock as his life study.

5. **Patula umbilicata** Montagu.

Pretty common in the upper regions of the rock.

6. **Helix (Gonostoma) lenticula** Fér.

Common under stones and in rock crevices.

7. **Helix (Gonostoma) calpeana** Morelet.

I have only collected about 20 specimens of this species in rock fissures near the military hospital, and according to my knowledge it is confined to Gibraltar. I have not met with it higher up on the rock, but in the gardens it might be found more frequently, especially at the foot of old walls. My largest specimens are 13.5 mill. in diameter.

8. **Helix (Tachea) Coquandi** Morelet var. **Ellioti** m.

Differt a typo testa minore, raro 20 mill. cuperante tenuiscula.

There occurs a peculiar smaller form of *H. Coquandi* on the rock of Gibraltar which justly deserves a name to itself. Striped specimens, which in many respects incline towards *H. splendida*, were only seldom met with, and then there were besides the five bands,

in many cases, also spots in various stages of development. All these specimens have a light yellow ground color without a lighter stripe at the keel. By far the most of them however have, besides a darker yellow tint, a lighter band in the middle, and also dark horn-colored markings. The bands are broken into spots with the exception of the middle one lying above the lighter stripe, which is often well marked.

H. Coquandi was found almost everywhere along the more cultivated parts of the rock, but only in single specimens. I only collected about 20 of them, all fully developed. It is most abundant between Signal Point and O'Hara Tower, on the road joining these two localities. In June however, I found a great number of young specimens on the steep foot path leading from Mediterranean Road to the ridge of the rock, crawling on *Chamærops humilis* its favourite plant.

9. **Helix (Macularia) lactea var. alybensis** m.

I have already minutely dealt with this form and its relations to the allied South Spanish and North African forms in the Iconographie (Neue Folge, vol. i., and illustrated a specimen from Gibraltar, fig. 67, p. 28). It is commonly met with in masses in rock crevices, not unfrequently in company with *H. marmorata*, also on the under side of Agave leaves. The frequency of albinos is very striking, especially in the higher regions. I gathered in the few days of my sojourn about 30 specimens in all stages of growth, with transparent bands or only with transparent spots, but likewise thick-shelled and completely opaque, and sometimes with white, sometimes with rose-coloured peristome. On the opposite side, near Algesiras, a closely-allied form occurs (*H. tigrina* Servain), which is somewhat flatter however, and shows a more inflated last whorl.

10. **Helix (Macularia) marmorata** Férussac.

This is the characteristic shell of Gibraltar, common in every part of the rock, but easily overlooked, being always concealed in the fissures of rocks, in these however they occasionally stick together in big lumps. I collected the finest specimens towards the Southern Slope. Now and then spotless forms with well marked bands may be found, while usually only the two lowest bands are distinct. Specimens without well marked stripes are less common. There are only two albinos among the several hundred specimens I collected.

H. marmorata is characteristic of the whole district from Malaga and Grenada to Gibraltar. *Helix loxana* Rossm. and *Helix Partschi* Bourg. (*balearica* var. *pulchella* Rossm.) are allied to it by transitions. I presume it may also be found beyond the Straits at the Monkey Mount.

11. **Helix (Iberus ?) Scherzeri** Zelebor.

This interesting shell, after having been almost unknown for a long time, was rediscovered, and I have already made a full report in the "Jahrbuch," 1881, as well as in the "Iconographie" (Neue Folge, i., p. 24, fig. 64), and figured the various forms. The reason for its having been overlooked is that it only lives on the loftiest parts, and there only in rock crevices difficult of access. In these however it occurs in large heaps cemented together by a blackish mucus, even the dead ones are frequently still clinging to the others. I found them at the Rock Gun as well as at Signal Point and below O'Hara Tower, but always confined to a few fissures, which nevertheless yield several hundred specimens. It is easily distinguishable from *H. marmorata* by the white peristome, and stands between the latter and the splendid forms I discovered in the mountains near Tetuan, and which are closely

allied to the Sicilian group, *globularis*, *platycheila*, &c. At the Monkey Mount and the Sierra Bullones kindred forms might no doubt be found.

12. **Helix (Pomatia) aspersa** Müller.

In masses in the rock fissures on the road to Signal Point, probably also in other parts. The color in these is very dark.

13. **Helix (Euparypha) pisana** Müller.

Very numerous upon windmill flat and Europa Point, also higher up on the rock.

14. **Helix (Heliomanes)** sp.

In the low-lying ground between the Rock Gun and Signal Point I found a *Xerophile* in great numbers allied to *variabilis*, but unfortunately none were fully developed and I was unable to discover any full grown dead specimens either. I fancy it is identical with a form I found later on near Algesiras, I am not certain, and defer the determination in the meantime.

15. **Helix (Turricula) simiarum** m.

Testa depresse conoidea, anguste sed profunde umbilicata, subtiliter regulariterque costulato-striata, alba, fascia latiore suturati castanea suturam in spiram sequente super peripheriam nonnullisque minus distinctis ad basin ornata. Anfractus 5—6 parum convexi, regulariter crescentes, ultimus ad peripheriam subangulatus, antice breviter deflexus, basi planatus. Apertura subangulato-ovata, sat lunata, peristomate simplici distincte labiato.

Diam. maj. 9; min. 8. Alt. 5 mill.

Shell depressed and conical, umbilicus deep and narrow not enlarging towards the base, fine and regular striations, white with a dark chestnut-colored band at the periphery running along the suture to the apex and with a lighter one at the base. The 5—6 whorls

are slightly arched and increase with regularity, the last one is obtusely angular, shortly bent down in front and flat below. The aperture is oval but slightly angular, crescent-shaped with a simple but distinctly labiated peristome. I have already published the diagnosis of this species in the yearly report of the German Malacozoological Society, ix., p. 70. It is nearest related to the South Spanish *derogata*, but has the umbilic not expanded towards the aperture. It is only to be found in the higher parts of the rock, clinging to stones, rather isolated, more common on the east side, where it usually crawls about on grasses and *Chamærops*.

16. **Helix (Candidula) conspurcata** Drap.

Here and there, not too common.

17. **Helix (Cochlicella) acuta** Müller.

Only at the lower parts of the rock, in abundance on the rails of the bridge leading to the mainland, and also on windmill flat.

18. **Ferussacia folliculus** Gronov.

A pretty common form in rock crevices.

19. **Stenogyra decollata** Linné.

Not very abundant.

20. **Pupa calpica** Westerlund.

Not rare, but local and difficult to find, its color being so much like that of the rocks. I only gathered it in isolated spots near Rosio Bay. It is however more common on the higher parts of the east side. It is more easily found in those places where the rocks have not long ago been quarried, and are therefore of a lighter color.

ON A PARASITE OF *LIMNÆA TRUNCATULA*.

By J. T. MARSHALL.

No. 11 of the "Journal of Conchology" recorded the fact that a parasite of *Limnæa truncatula* (*Fasciola hepatica*) caused the liver-fluke in sheep. The question is such an important one, though not so much to naturalists as to farmers, that I think it deserves more than a few lines in a journal devoted to conchology, and with your permission I will lay before your readers a short account of the life-history of this parasite, which caused the death, during the winter of 1879—1880, of no less than three million sheep!

One of the half million eggs of one of these dire parasites, lying in water or on damp grass, is duly hatched, and forthwith there emerges, lifting the lid with which the egg is considerately provided, a ciliated infusoriform embryo, about the 175th of an inch in length. For it the future is grave indeed. Long the work, short the time, and the opportunity fleeting; within eight hours it must find its host or die, and that host is the tiny water snail, *Limnæa truncatula.* Accordingly, the instinct of the embryo is unerring—so unerring, that when a large number of them are put into water containing an assortment of water snails, some forty of fifty embryo will, perhaps, bore their way into each *Limnæa truncatula*, inflicting fatal injuries; while the other equally soft and inviting mollusks remain wholly unassailed. The part they chiefly aim at, and mostly achieve, is the pulmonary cavity of the snail, the one part that suits them to perfection; indeed, if they have by accident located themselves in the harder foot they survive for a few days only. They effect their entrance by means of a bradawl-like projection of the head. This is utilized after the following ingenious fashion. It is embedded in the integument of the snail, its owner meanwhile spinning round with great velocity, and thus, top-like, it gradually wedges *its way* within. This achieved, the cilia are cast, the bradawl

is laid aside, and in about a fortnight the embryo becomes an adult *sporocyst.* But in the *sporocyst* itself (to follow up this strange eventful history) change soon occurs, and within is visible a numerous progeny of *rediæ:* creatures resembling the *sporocysts* or *brood-cysts*, only that they are provided with an intestinal tract. These *rediæ* continue to grow until the *sporocyst* is nothing but a bag surrounding them—a bag that in due course parts and sets them free, as they are successively matured, within the pulmonary cavity of the snail, which I may mention they soon exchange for the liver of the mollusk. But just as the *rediæ* were a progeny within the *sporocysts*, so within the *rediæ* themselves another progeny arises, sometimes of daughter *rediæ*, but more frequently of quite another form, viz., the tadpole-like *cercaria*, the last a long known form, though only comparatively recently recognised in its due place and relationship. The *cercariæ* at last escape by a special aperture, and leave, first their nurse and then their snail host, and embark on a roving career in the water. But this fitful life (every stage of which has again and again been seen) draws to a close, and the *cercariæ* adheres at last to a blade of grass by the stream or pond side, casts off its tail, and encysts itself. And there matters for it will end, and it will enter upon a long, perhaps an eternal sleep, unless its grass-blade should be swallowed by another animal, and best of all by a sheep. Should this occur, it will commence to live actively once more, and will finally attain in about six weeks its summum of development as a perfect liver-fluke. From this proceed the countless and tiny ova with which our history began. A small bottle of this ova is sufficient to kill every sheep in Great Britain! We have, therefore, these distinct and diverse forms—1, *ovum;* 2, *ciliated embryo;* 3, internally produced *sporocyst;* 4, internally produced *redia;* 5, internally produced *Cercaria;* eventually passing into a perfect *Fasciola hepatica*—a series of transformations unparalleled in any chapter of natural history. Such being the history, the cure is plain. Keep sheep on dry pastures, provide them with

water, but let them not have access to the ponds and ditches, and so you will arrest what in certain quarters is a veritable plague. Thus can curious biological research give aid amid the difficulties of daily life.

Mr. Thomas, of Balliol College, Oxford (assistant to the late Professor Rolleston), has gained the deserved merit of unravelling this mystery, and cleared up points impenetrable even to the ingenuity and industry of Leuckhart, who independently and almost simultaneously made the discovery of the host-ship of *Limnæa truncatula;* but whereas Leuckhart was uncertain as to his conclusion, later in point of time, and missed the very salient point as to the encystment on the grass (thinking the sheep accidently swallowed the little snails with the contained *cercariæ*), there can be no doubt the chief honour will rest with Mr. Thomas, who has devoted two years to this investigation, which, instituted by the late Professor Rolleston at the request of the Royal Agricultural Society, was entirely worked out in the Oxford Museum. And the development of this mystery is an answer to those unphilosophical minds who think naturalists' studies trivial and unimportant.

Pupa secale var. **alba.**—It will be as well to correct a mistake in Mr. Rimmer's Land and Freshwater Shells of the British Isles, 1880, wherein, at p. 152, he gives as a locality for this variety "Pateley Bridge, Yorkshire (Lister Peace), *J. C.*" If the reader will turn to p. 36 of the first volume of the Journal of Conchology, he will see that the shell which Mr. Peace found at Pateley Bridge was *Pupa umbilicata* var. *alba.* No doubt the mistake was made through inadvertence, as at p. 155 Mr. Rimmer gives the record correctly under *P. umbilicata.* From the point of view of the geographical conchologist it is desirable to at once correct a mistake of this kind.—Wm. Denison Roebuck.

New Yorkshire Locality for Planorbis lineatus.—This interesting species—for which Dringhouses Bog near York has long been the only locality recorded for the county—was discovered at Hornsea Mere in the East riding in 1881 on the occasion of the Yorkshire Naturalists' Union's excursion. They were discovered by my friend Mr. J. Darker Butterell, and I also had the pleasure of collecting a series, being in his company at the time. They were common but very local, and had a predilection, as at Dringhouses, for the shallow water on the grassy margins of the Mere.—WM. DENISON ROEBUCK.

Ancylus lacustris var. **albida at Christchurch.**—We find this species in the River Stour, located as usual on the leaves and stems of the water-lily, but the ten or twelve specimens met with all belong to the white variety. The milk-white shells are covered with a light-green vegetable coating. *Ancylus fluviatilis* occasionally occurs with it, but is of typical character. —C. ASHFORD.

Pulsations of Helix rufescens.—I have satisfactorily traced continuous heart-action in this species throughout the autumn and winter, down to a temperature of 31° F. Just below freezing point the contractions numbered five to six a minute—full and very deliberate. In Hampshire, *H. rufescens* retires temporarily when the thermometer falls below 38° or 40°. Above 40° some—both adult and young—are to be found about during any damp night in winter.—C. ASHFORD.

Pupa umbilicata Drap.—A variety of this species is mentioned by Mr. R. Tate in his "British Mollusks," p. 154, as having two teeth or denticles. It is however worthy of remark that he makes no mention of the *bigranate* form of *Pupa marginata*, and it is therefore not improbable that the remark was intended to be applied to that species and not to *P. umbilicata*. —J. W. TAYLOR.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY, 1882.

Meeting,

HELD SEPTEMBER 7TH, 1882,

Mr. J. W. Taylor, Vice-President, in the Chair. Minutes of the August Meeting were read and approved.

SPECIMENS EXHIBITED.

Mr. Thos. W. Bell showed specimens collected at Peterborough and other localities eastward of that place, viz.:—*Helix nemoralis* and varieties *arenicola* and *albo-labiata*, *H. arbustorum* and var. *flavescens*, *H. virgata* and var. *albida*, *H. caperata* var. *major*, *H. rufescens* var. *minor*, *H. sericea*, *H. aculeata*, *Cochlicopa lubrica* and var. *lubricoides*, *Pupa marginata*, *Carychium minimum*, *Limnæa peregra* var. *intermedia*, *L. auricularia*, *L. palustris*, *Bythinia Leachii*, *Valvata piscinalis* and others.

Meeting,

HELD SEPTEMBER 28TH, 1882.

Mr. J. W. Taylor, Vice-President, presided. Minutes of previous Meeting were read and confirmed. Correspondence was read from Mr. J. A. Ollard and the Linnean Society, N.S.W.

DONATIONS TO THE LIBRARY.

The Proceedings of the Linnean Society of New South Wales.

PAPERS READ.

"On the action of the heart in the Helicidæ during hibernation," by Mr. C. Ashford.

SPECIMENS EXHIBITED.

A large number of shells from British and Foreign localities were brought up for exhibition, including some exceedingly interesting specimens.

Mr. W. Nelson had exhibits from Dudley, Stonehouse, Gloucester, Kew and Chiswick; also the following from the Isle of Man:—*Limnæa peregra*, *L. truncatula*, *Helix caperata* and *H. ericetorum* from Kirkmichael. The *H. ericetorum* are deficient of the numerous bands below the periphery. *Limnæa peregra*, *Planorbis albus*, *Valvata piscinalis* and *Physa fontinalis*, River Killane. *Planorbis albus* and *Valvata piscinalis*, The Curragh, near Sulby. *Bulimus acutus* var., from Ballakinnag. The specimens shown of this variety were all dark colored. Mr. Nelson stated that the variety *bizona* of *B. acutus*, which occurs at Port St. Mary, is likely soon to be destroyed.

Mr. W. D. Roebuck exhibited shells from Wensleydale, Semerdale, Wharfedale, Nidderdale, Pilmoor, Airedale, Spurn Point and the Wakefield district. Many of the specimens of *Helix nemoralis* from Spurn were characterised by transverse bands, and others had no markings below periphery.

Mr. Roebuck showed specimens on behalf of Mr. F. R. Starling from Bristol, and Mr. W. West from Malham; also the following collected by Mr. Alfred Denny:—*Arion rufus*, Heidelberg Castle; *Helix pomatia*, Konigswinter, September 9th, 1882; *H. nemoralis* var. *Cuvieria* (Moq.-Tan.) and *H. nemoralis* var. *Draparnaudia* (Moq.-Tan.), Rotterdam; *H. nemoralis* var. *Petiveria* (Moq.-Tan.), *H. hortensis* var. *fusco-labiata* and sub-vars. *lutea* and *Baudonia*, Drachenfels, Rhine, Sept. 9th, 1882.

A few shells recently collected at Saltburn were shown by the Secretary (Mr. T. W. Bell).

Meeting,

HELD NOVEMBER 2ND, 1882,

The President, Mr. Wm. Cash, F.G.S., in the Chair. Minutes of previous meeting were read and confirmed. The following

DONATIONS

were announced:—

"Abstract of the Proceedings of the Linnean Society, New, South Wales, August, 1882."

"A List of Correspondents of the Smithsonian Institution, U.S.A."

NEW MEMBERS.

Geo. H. Parke, F.L.S., F.G.S., of Infield Lodge, Furness Abbey, was nominated for membership.

SPECIMENS EXHIBITED.

The President exhibited a number of specimens of *Achatinella*, remarking that the genus, of which about 228 species have been described, is peculiar to the Sandwich Isles. Their distribution in these islands presents in a marked degree the tendency which the species of oceanic islands, as opposed to those of continental areas, have to vary to a very large extent. Thus, the Achatinelline species are not merely restricted to particular islands, but even to particular valleys or restricted localities within the limits of any one island. Moreover, they appear in some instances to be confined to particular species of indigenous plants, and as the increasing civilization of the islands is doing its usual share in the extermination of some of the more local species of these plants, it is probable that their species of *Achatinellæ* will either die out or become further modified from the change of the conditions under which they live. Thus the genus affords good opportunities for the study of tendencies to variation, and of the influence environment has upon those tendencies. The following are the species exhibited:—*Achatinella rubiginosa* Newc., *A. Dunkeri* Pfr., *A diversa* Gul., *A. gravida* Fér., *A. bacca* Rve., *A. Swiftii*, *A. castanea* Rve., *A. auricula* Fér., *A. abbreviata* Rve., *A. lirata* Fér., *A. producta* Rve., *A. turritella*, *A. olivacea* Rve., *A. pulcherrima* Swains., *A. Johnsonii* Newc., *A. varia* Gul., *A. ventulus* Fér., *A. trilineata* Gul., *A. curta*, *A. tæniolata* Pfr., *A. straminea* Rve., *A. virens* Gul., *A. sanguinea* Newc., *A. Stewartii* Gul., and *A. adusta* Rve., all from Oahu; *A. physa* Newc., from Hawaii; *A. biplicata* Newc., and *A. crassa* Newc., from Lauai; *A. perdix* Rve., and *A. affinis* Newc., from Maui; *A. virgulata* Migh., *A. polita* *A. renista* Migh., *A. tesselata* Newc., *A. plicata* Migh., *A. rufa*

Newc., *A. virgulata* Migh. var., *A. bella* Rve., *A. nubilosa* Migh., *A. Mighelsiana* Pfr., from Molokai.

The President also showed a reversed example of *Buccinum undatum*, from Flamborough Head; *Limnæa glutinosa* and *Helix carthusiana*, from Deal; *H. revelata*, Whitsand Bay, near Plymouth; *L. peregra* (sinistral), from Scarborough; *L. Burnetti*, from Loch Skene; *Geomalacus maculosus*, from Curragh, near Killarney; *Succinea oblonga*, Ballincollig; *H. obvoluta*, from near Winchester; *Vertigo Moulinsiana*, near Watford, Hertfordshire; *V. antivertigo*, near Bristol; *V. alpestris*, Patterdale; *V. pusilla*, Lipwood House, Northumberland; *V. substriata*, Gibside Wood, Durham; *V. angustior*, from Connemara; *H. pomatia*, Stalisfield, Kent; *Planorbis corneus* var. *albina*, Deal, Kent.

Meeting,

HELD NOVEMBER 16TH, 1882.

Mr. J. W. Taylor, Vice-President, presided. Minutes of the previous meeting were confirmed. Correspondence was read from Messrs. B. Holgate, F.G.S., Leeds; R. Scharff, Edinboro'; and W. Jeffery, Ratham.

DONATIONS

were announced as follows:—From A. Ramsay, F.G.S.—"The Scientific Roll," vol. i., part ii., No. 9; From Wm. Jeffery, Ratham—A contorted specimen of *Planorbis spirorbis*.

SPECIMENS EXHIBITED.

Mr. Jeffery sent for exhibition specimens of *Helix fusca*, Ratham; *H. pulchella*, Woodmancote; *Limnæa truncatula*, Woodmancote; *L. palustris*, Arundel; *L. peregra*, Hayling; *L. peregra* var. *acuminata*, Chidham; *Planorbis corneus* var. *albina*, near Arundel; *Sphærium corneum* var. *flavescens*, Burton; *Zonites nitidus*, Arundel. Mr. Jeffery also sent three specimens of the white variety of *Planorbis corneus*, and in an accompanying note

remarked that he "got some specimens of *P. corneus* last year from near Arundel of the ordinary horn color and bred the two small white ones from them. On revisiting the locality this year I got the larger specimen, which I think clearly establishes the fact of that variety being found there; and at the same time shows that it is irregularly bred from the usual type."

Mr. B. Holgate sent specimens of *Helix aspersa*, *H. virgata*, *H. caperata* and *Bulimus acutus*, from the Quenvais in the island of Jersey.

Mr. W. Nelson also showed several shells collected at Alwoodley and Sicklinghall.

PUBLICATION OF COUNTY LISTS.

The Recorder suggested that a commencement should be made in respect of publishing in the journal a series of authenticated county-lists of mollusca to be extracted from the record book. He gave statistics of the number of species—also of localities—recorded for the different counties of the British Isles, every one of which records had been authenticated, by the exhibition of specimens at the meetings and their scrutiny by the society's referees, and stated that of all the counties and vice-counties the one which was in the most forward state was the Mid-West division of Yorkshire, for which about 123 species and varieties had been authenticated.

The suggestion was adopted and the recorder was empowered to extract from the records, for publication, a list of the mollusca of Mid-West Yorkshire, no records being included that had not been authenticated in the manner spoken of.

REVISED LIST OF BRITISH MOLLUSCA.

Attention was drawn by the Committee to the desirability of a new and revised list of the British land and freshwater mollusca being prepared, Messrs. W. Nelson and J. W. Taylor's list being now out of print. It was also pointed out that so many additions of varieties had been made to the British list during the last decade, that a new list, if published, should first

undergo a careful examination, and it was now suggested that the society might well undertake such a task. It was therefore unanimously resolved that a sub-committee, to consist of Messrs. W. Nelson, W. D. Roebuck and J. W. Taylor, with the President and Secretary, be requested to take the subject into consideration, and report to the meeting to be held at Halifax in December next.

Annual Meeting,

HELD DECEMBER 4TH, 1882,

At Halifax; the President, Mr. Wm. Cash, F.G.S., in the Chair. Minutes of the November meeting were approved. Correspondence was read from the President and Messrs. J. W. Davis, F.S.A., F.L.S., &c., J. W. Cundall, R. Scharff, F. Hepburn, B.A., E. Collier, H. Laver, M.R.C.S., F.L.S., J. C. Melvill, M.A., F.L.S., A. Leicester, Dr. Kobelt, Rev. H. Milnes, and the Linnean Society of New South Wales.

NEW MEMBERS.

Geo. Hy. Parke, F.L.S., F.G.S., was elected a member of the Society; and John Morgan, Mulgrave Rd., Sutton, was nominated for membership. The following

DONATIONS

were announced:—

"Proceedings of the Linnean Society, New South Wales," vols. iv., v. and vi, and part 2, vol. vii., from the Society.

A PAPER

On the Land Shells of Gibraltar, by Dr. Kobelt, was left over for communication at the next meeting.

THE REPORT OF THE SUB-COMMITTEE

appointed to revise the list of British Land and Freshwater Shells was communicated by Mr. W. D. Roebuck, who explained on what lines the Committee proposed to proceed in the work of revision.

THE ANNUAL REPORT

was next read by the Secretary and adopted.

THE RECORDER,

Mr. W. D. Roebuck, presented his Report, which was adopted.

THE TREASURER

read the Cash Account for the year, which showed a balance in favour of the Society of £4 0s. 10d.

ELECTION OF OFFICERS.

The following were elected officers for the ensuing year:—*President*—W. Hill Evans, M.D.; *Vice-Presidents*—Wm. Jeffery and Edwd. Collier; *Treasurer and Secretary*—Thos. W. Bell; *Recorder*—W. Denison Roebuck; *Committee*—Wm. Nelson, J. W. Taylor, Wm. Cash, F.G.S., J. W. Cundall, G. H. Parke, F.L.S., and J. D. Butterell.

NOTICE.

Mr. W. D. Roebuck gave notice of his intention, on an early date, to bring forward a motion to alter Rule 7, with the object of having *four* vice-presidents instead of *two*, as at present.

PRESIDENTIAL ADDRESS.

The President delivered an Address on the "Classification of the Cephalopoda," in which he reviewed at length the present state of our knowledge of the subject, and examined the basis of the present classification, illustrating his remarks by anatomical demonstrations, models, and carefully prepared fossil specimens.

THE REPORT, 1882.

The Committee have pleasure in reporting the continued success of the Society, and feel that the increased interest manifested in the Society's work by a constantly increasing number of members is eminently satisfactory.

The ordinary Meetings (the present meeting at Halifax making the twelfth) have been most successful.

The correspondence, which has been unusually large, has also been of an interesting character; and the Exhibits have been much more numerous than in any previous year.

Papers have been communicated by the President, Mr. W. Jeffery and Mr. Chas. Ashford.

Specimens have been sent for exhibition by Mr. Jeffery and Mr. J. W. Cundall. The President, Rev. H. H. Milnes and Messrs. W. Nelson, J. W. Taylor, W. D. Roebuck and the Secretary, have also contributed largely to the number of exhibits that have been made.

The Library has been enriched by valuable Donations from A. Ramsay, F.G.S., the Editor of the Scientific Roll; the Linnean Society of New South Wales; and the Trustees of the Smithsonian Institution.

The scheme for making Authenticated County Records of Mollusca has been well received; several members co-operating most heartily with the Committee by sending lists and submitting specimens to the Society's Referees for identification. The Committee hope soon to be able to publish some of these records, which they believe will greatly tend to increase our knowledge of the distribution of the mollusca.

THE RECORDER'S REPORT FOR 1882.

The Recorder of the Conchological Society has to report that during the past year the Record System, hitherto practically confined to Yorkshire Land and Freshwater Mollusca, has been extended, so as to include records bearing upon the mollúscan faunas of the other counties of the British Isles. He has also to report that the total number of species and records, in authentication of which voucher-specimens have been shown at the meetings and examined by the society's referees, has been largely in excess of the number shown in any previous year. This is mainly attributable to the labours of Messrs. W. Nelson, W. West and W. D. Roebuck, who have all shown numerous specimens from Yorkshire localities (besides

a few from other counties), and of Mr. T. W. Bell, who has similarly illustrated the molluscan faunas of Northamptonshire and Cambridgeshire. A full series of the shells of Western Sussex has been shown on behalf of Mr. W. Jeffery, and another series of the shells found round Bristol by Mr. J. W. Cundall. The records of the two latter gentlemen form the basis of papers written by them and published in the "Journal of Conchology."

Of Yorkshire shells, 830 records of 95 species and varieties have been authenticated—making a decided advance upon the previous year's figures, when only 200 records of 63 species and varieties were made. Fourteen of the forms which were shown from Yorkshire localities were this year exhibited for the first time. This makes the total number of exhibits from Yorkshire localities since the foundation of the Society amount to 2136; the total number of forms—species and named varieties—being 145. For the remainder of the British Isles, we have had altogether 534 records for 44 counties or divisions of counties. Of these, 70 forms have been recorded for West Sussex, 59 for Northamptonshire, 35 for the Bristol district, 23 for the Isle of Man, and 19 for Cambridgeshire; while none of the others have reached these figures, excepting, of course, the five divisions of Yorkshire, the numbers of which are as follows:—122 for Mid-West Yorkshire, 94 for South-West Yorkshire, 67 for North-West Yorkshire, 58 for South-East Yorkshire, and 43 for North-East Yorkshire.

The object for which the records are accumulated is the ultimate preparation for publication of a series of county-lists of Mollusca, which shall be of uniform and known value, serviceable for the use of writers on the geographical range of mollusca, and the merits of which shall be that every statement contained in them shall have been vouched for by the actual exhibition of a specimen to competent judges. It is thus hoped that a service to conchological science may be rendered, similar to that which has been rendered to geographical botany by the medium of the admirable system, stringently enforced, of the Botanical Record Club.

As the numbers for the different counties reach 50 forms or more, it is intended to publish the lists, beginning, of course, with those for which the largest amount of work has been done. The publication of the list for Mid-west Yorkshire has already been authorised.

The Recorder has, in conclusion, only to hope that conchologists—and especially members of the society—will co-operate in the work by forwarding specimens (accurately labelled, with locality and other particulars) from their own or any district which they may collect in. And they may be reminded, that of the 149 counties and vice-counties into which, for this purpose, the British Isles are divided, there have as yet been only authenticated records of this kind for 49 of them, leaving no less than 100 counties—equal to two-thirds of the whole number—in the position of never having been represented at the meetings by a single mollusk.

BIBLIOGRAPHY.

Manual of Conchology, structural and systematic.—With illustrations of the species by Geo. W. Tryon, junr., Conservator of the Conchological Section of the Academy of Natural Sciences, Philadelphia. Parts xvii. and xviii.

Part xvii. commences the fourth volume of this comprehensive work, and is devoted to the families Marginellidæ, Olividæ and Columbellidæ. The family Marginellidæ is divided into the genera *Erato* Risso, with eighteen species, and *Marginella* Lam., with 230 recent species, the majority of which are from the Caribbean region. The author deals exhaustively with the arrangement and classification of this group, and also gives in detail the views of the different authors who have written upon the subject. The arrangement adopted is that proposed by Weinkauff in his Synonymic Catalogue of the genus, published in the Jahr. d. deutsch. Mal. Gesel.—two

divisions characterized by the possession or absence of a basal sinus—those species possessing that peculiarity are considered true *Marginellas*. They are then divided into the genera *Marginella* H. and A. Ad., of which *M. glabella* is the type, *Persicula* Gray, and *Closia* Gray. The second division, without basal sinus, is separated into three sections, and there are again split into several groups. This interesting family is illustrated by no less than 13 plates, with 319 figures.

The family Olividæ is next treated of, and is divided into three subfamilies—Olivinæ, which embraces three genera and four subgenera, Ancillariinæ with two genera and three subgenera, and Harpinæ, with *Harpa* Lam. The genus *Oliva* is divided into the typical genus *Oliva*, of which *O. porphyria* L., is the type, the subgenus *Lamprodoma*, containing only *O. volutella* Lam., the subgenus *Callianax*, with two species, and *Agaronia* with five species, of which *O. hiatula* Gmel., is the type, and the subgenus *Olivancillaria* with four species. The subfamily Ancillariinæ is divided into the genera *Monoptygma* and *Ancillaria*, the latter with two subgenera. The subfamily Harpinæ has only the genus *Harpa*, and contains nine species, several species previously considered distinct having been reduced to synonyms.

The Columbellidæ is arranged to contain the genus *Columbella* with twelve sections or subgenera and five other genera, *Alcira* Adams, *Engina* Gray, with subgenus *Pusiostoma*, *Columbellina* D'Orb., *Columbellaria* Rolle, and *Amphissa* Adams. The groups are all amply illustrated by a large number of plates, crowded with figures, showing not only the shell, but the dentition, the animal, &c.

Pupa ringens in Sutherlandshire.—Mr. Baillie of Brora, has informed me that he has found *Pupa ringens* in the above county.—JOHN W. TAYLOR.

DESCRIPTIONS OF NEW BRITISH VARIETIES OF FRESHWATER SHELLS.

By W. NELSON.

[Read before the Conchological Society.]

Planorbis nitidus var. **albida** n. v. Shell white.

Taken by Mr. Ball at Brigg, Lincolnshire and by myself at Alum Rock, near Birmingham.

Planorbis spirorbis var. **albida** n. v. Shell white.

Found at Newton near Wakefield, some years ago, by Mr. Wilcock, to whose kindness I am indebted for specimens.

Physa hypnorum var. **major** Moq. Shell larger, 18 mill. long.

Taken by Mr. F. Shrive near Birmingham.

Physa hypnorum monst. **decollatum** n. m. Spire decollated.

Ditch at Hesel near Ackworth, S.W. Yorks.

Limnæa peregra var. **candida** Porro. Shell white.

Taken by Mr. Whitwham at Askern. This variety has been recorded as var. *albida* by Mr. L. Peace.

Limnæa auricularia var. **magna** Colb. Shell larger. Aperture narrower, outer margin nearly parallel to the columella, which is straight, upper edge reaches the commencement of the spire, which is sharp. Length 32 mill.

Near London.

Limnæa auricularia var. **reflexa** n. v. Shell having the outer lip much reflected.

Found by Mr. Whitwham near Huddersfield and presented to Mr. J. W. Taylor, to whom I am indebted for the opportunity of describing this remarkable variety.

Limnæa auricularia var. **ampla** Hartmann. Spire short, aperture extending beyond the apex.

Found by Mr. Jeffery in a pond in his garden at Ratham, near Chichester.

Limnæa palustris var. **fasciata** n. v. Shell of the same size and form as the type, with three spiral bands of a darker brown color on the body-whorl.

Found by Mr. J. W. Taylor in a ditch, Leventhorpe pastures, near Leeds, to whom I am again indebted for an examination of this remarkable variety.

Prof. Issel records the occurrence of distinctly banded specimens of this species in the Lago d'Alice, Piedmont.

Limnæa truncatula var. **ventricosa** Moq. Spire shorter, whorls more ventricose.

Found in a ditch at Osmondthorpe, near Leeds.

Limnæa glabra var. **major** Gassies. Shell much larger, 23 mill. in length.

Taken by Mr. Wilcock at Ossett, S.W. Yorks.

Limnæa glabra monst. **decollatum** n. m. Spire decollated.

In ditches at Batley, near Leeds, and at Sparkbrook, near Birmingham.

Ancylus lacustris var. **Moquiniana** Bourg. Shell rather risen, rounded in front and behind, more recurved, a little blunt. Aperture elliptical, narrow and somewhat thick; peristome not expanded.

Pond at Osmondthorpe near Leeds.

DESCRIPTION OF A NEW VARIETY OF *LIMAX AGRESTIS*.

By J. DARKER BUTTERELL, Beverley.

[Read before the Conchological Society.]

During the past few months I have met with specimens of a black form of our common field-slug, which does not appear to be described in Moquin-Tandon's or any other work to which I have access. I will therefore characterize it as follows:—

Limax agrestis var. **nigra** n. v. Animal jet-black, tentacles bluish or brownish-black, under side of foot somewhat paler in hue. In every other respect the shell and animal agree with the type.

Mucus milky.

Inhabits gardens, perhaps more particularly affecting pansy-beds, Beverley, J. D. Butterell and F. Boyes, 1882. Also found at Raskelf in 1882, W. Denison Roebuck; and some years ago in a wood near Tadcaster, F. G. Binnie.

Where found there are generally also intermediate specimens more or less blotched with black.

If placed in liquor potassæ the black colour is discharged, and the animal assumes an uniformly rich brown tint.

Helix lapicida var. **albina near Bristol.**—An amateur collector some time ago found a white *Helix lapicida* near Leigh Court. I saw the shell and identified it. I have been myself to the locality but could find none—not even the type.—(Miss) F. M. Hele.

DESCRIPTIONS OF SOME NEW VARIETIES OF BRITISH LAND AND FRESHWATER SHELLS.

By JOHN W. TAYLOR.

[Read before the Conchological Society.]

The following are a few variations of our land and freshwater shells that I have noticed at various times. It will I think be of interest to record them and thus help in some measure to illustrate the range of variation to which the different species are subject.

Limnæa auricularia var. **minor** Moq. Shell smaller. Diam. 15 mill., alt. 17 mill.

I found a specimen of this variety in the Warwick and Birmingham Canal, near Acock's Green, Worcestershire, in the spring of 1866.

Limnæa palustris var. **minor** n. v. Shell smaller. Length 8 mill., diam. 4½ mill.

I have found a few of this minute form in a ditch by the side of the Warwick canal, at Smallheath, near Birmingham.

Limnæa palustris var. **lacunosa** Ziegl. Shell with strong regular and distant transverse striæ and prominent spiral ridges.

I have found this variety in a drain at Leventhorpe pastures, near Leeds (Mid-West Yorkshire).

Zonites fulvus var. **viridula** n. v. Shell transparent greenish white.

This beautiful variety has been collected near Huddersfield by Mr. J. Whitwham, and is now in his collection.

Helix virgata var. **minor** n. v. Shell smaller. Diam. 6½ mill.

Mr. C. Ashford has kindly given me specimens of this variety from Yarmouth, Isle of Wight, and Mr. J. W. Wood some from Freshwater in the same island, the latter gentleman remarking that "this small form covers the tips of the short bare grass of the chalk downs". Mr. Boland has also favoured me with the same form from Tenby; and I have also received it from the late Mr. Hatcher of London, who collected them in the Scilly Isles.

Helix virgata var. **major** n. v. Shell larger. Diam. 20 mill.

I have received through the kindness of Miss F. M. Hele, of Bristol, two specimens of this form from that neighbourhood. Mr. J. W. Wood has also given me it from Freshwater, Isle of Wight, with the remark that he found it only in one place where the earth had been piled up into a bank, and was covered with thick grass and herbage; it was associated with the v. *strigata* of *Bulimus acutus*. Dr. Jeffreys records it from Weymouth.

Helix virgata var. **leucozona** n. v. Shell violet-brown or reddish-brown, with a white zone at the periphery and sometimes with a paler area around the umbilicus.

Dr. Gray ('Turton's British Shells,' p. 160) was aware of the occurrence of this variety, remarking that 'the most singular variation of this species is that of a dark brown with a single white band.' I have been favored with specimens from Hayle, Cornwall, by Miss S. Hockin; Weston-super-Mare, by Miss F. M. Hele; and Tenby, by Mr. W. H. Boland.

Helix virgata var. **alba** n. v. Shell pure white, with translucent bands.

Miss F. M. Hele has kindly given me a specimen of this variety from Clevedon, and an immature shell

from Portishead, both places situate in North Somerset. I have also a specimen from Galway presented to me by Mr. Nelson and Mr. A. H. Cooke records it in the MacAndrew collection from Dublin.

Helix virgata var. **subalbida** Poiret. Shell white, with one band above the periphery.

Dr. H. Franklin Parsons kindly gave me two specimens collected by him in East Somersetshire. I have also specimens from Tenby, collected by Mr. Boland.

Helix virgata var. **nigrescens** Grateloup. Shell nearly uniformly dark blackish-brown, from the coalition and diffusion of the markings.

Mr. J. W. Wood of Northampton collected this variety at Freshwater, I. of W., in 1875. I am also indebted to Mr. Ashford for specimens from Yarmouth, Isle of Wight. Dr. Gray was aware of the occurrence of this variety in Britain, remarking (l.c. p. 161) 'sometimes the coloring which forms the bands is suffused over the whole shell, making it brown, or even nearly black.'

Helix caperata var. **obliterata** Picard. Shell white, with translucent markings.

Mr. Lister Peace has collected specimens of this variety at Balne Moor, near Pollington, Yorks., and I am indebted to his kindness for specimens of this and its allied variety.

Helix caperata var. **alba** Picard. Shell pure white without markings.

Mr. Peace was fortunate in finding this variety in company with the last.

Helix caperata var. **fulva** Moq. **Shell** dark brown or brownish, with some transverse whitish lines.

Found at Halton, near Leeds, by Mr. W. Nelson and myself; Miss F. M. Hele has also found it on the banks of the River Avon, near Bristol and has kindly given me a specimen.

Helix sericea var. **carinata** n. v. Shell sharply angulated at the periphery; aperture diam. 4 mill., alt. $2\frac{1}{2}$ mill.

I have collected this interesting variety on the banks of the River Wharfe, near Ilkley, Yorkshire, in company with the typical form and the var. *crystallina* of *C. tridens*.

Bulimus acutus var. **alba** Req. Shell entirely white.

This variety has not previously been differentiated from the type (*unifasciata*), by English collectors. I have specimens from Llandudno, kindly given me by Mr. Roebuck.

Bulimus acutus var. strigata Menke=var. *grisea* Req.

Shell with broad whitish or white ribs, alternating with transverse semi-translucent brownish-grey streaks.

Mr. J. W. Wood has favored me with specimens of this variety collected by himself at Freshwater, Isle of Wight; he informs me that this variety 'lies hidden among the thick grass in clusters near the roots, and is but seldom fully exposed like the typical form. It is local, and I gathered about 200 within a space of about 10 yards square, sometimes finding a cluster of a dozen without a single shell of the ordinary form near. It seemed to me on the spot as either an isolated variety breeding very true, or else the darker

color preserved it by natural selection from some enemy, as the ordinary whiter form was more conspicuous on the long grass, though it was not nearly as conspicuous on the short grass of the open downs, where the herbage is dusty and greyer-looking and intermixed with small particles of chalk.'

Bulimus acutus var. **articulata** Lam.=v. *maritimus* Desm. Shell with transverse white ribs, alternating with broad stripes of violet-brown.

Mr. T. Rogers has kindly given me a specimen of this variety from Tenby.

Bulimus acutus var. **nigrescens** n. v. Shell violet-brown, with a few fine whitish transverse striæ, and a pale area around the umbilicus.

Mr. W. Nelson has been so fortunate as to find this variety at Port St. Mary, Isle of Man; nearly all the specimens found with them have the bands more or less suffused over the surface of the whorls.

Pupa marginata var. **edentula** Moq. Aperture without denticles.

I have collected this variety at Brough, S.E. Yorks., and Mr. Cockerill has kindly given me specimens from Margate. It is the var. 1 of Gray.

Clausilia Rolphii var. **pellucida** n. v. Shell colorless or transparent.

Dr. J. E. Gray, at p. 216 of his edition of 'Turton's Britlsh Shells,' says that specimens of this species are occasionally found colorless or transparent, but does not specially name any locality. I have not been so fortunate as to see an example.

Succinea elegans var. **albida** n. v. Shell white.

Found by Mr. Butterell, in the neighbourhood of Beverley, S.E. Yorkshire.

Helix nemoralis var. **roseolabiata** n. v.=v. *hybrida* Moq. Peristome and rib pink or pale brown.

I have specimens of this from Boston, Lincolnshire, kindly given me by Mr. W. H. Hay.

Helix nemoralis var. **albolabiata** Von Martens. Shell with mouth and rib white.

I have this in a yellow ground color from Folkestone, given me by Mrs. Fitzgerald, and from Repton near Burton, from Mr. Hagger. I have also a specimen from Folkestone with somewhat transparent bands.

Helix nemoralis var. **bimarginata** Picard. Shell with white rib and black peristome.

I have this shell from Boston Spa, and I have seen specimens from near Driffield, collected by Mr. L. B. Ross, F.C.S.

Helix nemoralis var. **libellula** Risso. Shell yellow.

I have been favored with this form from near Minster, Kent, by Mr. T. D. A. Cockerell, and from Bristol by Miss F. M. Hele.

Helix nemoralis var. **rubella** Moq. Shell of a red or yellowish-red color.

I have found this form at Strensall near York, and I have received it from Miss F. M. Hele from Bristol, and Mr. Cockerell from Chislehurst.

Helix nemoralis var. **castanea** Moq. Shell of a chestnut color.

I have found this variety myself near Bristol, and Mr. T. D. A. Cockerell has given me a specimen from Chislehurst, W. Kent.

Helix nemoralis var. **hyalozonata** n. v. Shell with the bands transparent.

Mrs. Fitzgerald has with her accustomed kindness given me a specimen from near Folkestone, E. Kent.

Helix hortensis var. **roseolabiata** n. v.=v. *hybrida* Jeff. Shell with pink or rose colored rib.

I have this variety from Blagdon, Somerset (Miss Hele), Faversham (Miss Fairbrass) and Essex (R. M. Christy).

Helix hortensis var. **fuscolabiata** Von Martens. Shell with a dark peristome and rib.

I have this form from Folkestone (Mrs. Fitzgerald), and Mr. Ashford has kindly given me specimens from Christchurch, S. Hants.

Helix hortensis var. **lutea** Moq. Shell yellow.

I have this variety from Folkestone (Mrs. Fitzgerald), Faversham and Ospringe (Miss Fairbrass), and York.

Helix hortensis var. **incarnata** Moq.=v. *fagorum* W. & M. Shell of a rosy-red color.

I have this variety from Bilton near Bath, collected and obligingly given me by Miss F. M. Hele.

Helix hortensis var. **olivacea** n. v. Shell of a deep olive-brown color.

I have collected this variety at York.

Helix hortensis var. **lilacina** n. v. Shell of a bluish-violet color.

This variety has been found at Cawthorn near Barnsley, and at Ilkley, and Mr. T. D. A. Cockerell has sent me it from Chislehurst.

Helix hortensis m. **sinistrorsum** n. m. Shell reversed.

Found by Miss F. M. Hele at Coombe Dingle near Bristol, and by Miss Jessie Hele at Keynsham, N. Somerset. Both were of an uniform yellow colour.

Helix Cantiana var. **rubescens** Moq. Shell with the last whorl rufous.

I have a specimen from Horn Dean, S. Hants, kindly given me by Mr. Madison of Birmingham.

Helix Cantiana var. **albida** n. v. Shell entirely opaque-white.

Miss F. M. Hele has, with her usual generosity, given me a specimen from Bilton near Bath, and Miss Fairbrass has kindly given me one from nr. Faversham.

Helix Cantiana var. **galloprovincialis** Dupuy. Shell clear and somewhat translucent, aperture white inside, rufous outside.

Mr. T. D. A. Cockerell has obligingly given me a specimen collected by himself at Sarre, I. of Thanet.

Helix rufescens var. **rubens** Moq. Shell reddish.

This variety has been found near Hunslet by Mr. T. W. Bell, and Mr. Robert Scharff has kindly given me specimens from Hardraw Scar, N.W. Yorkshire.

Helix Pisana var. **lineolata** Moq. Shell whitish with numerous fine brown lines.

Mr. W. H. Boland has kindly given me specimens from Tenby.

Helix virgata var. **hypozona** Moq. Shell uniformly white above, and with the usual banding beneath.

Mr. Boland has favoured me with specimens collected by himself at Tenby.

Helix virgata var. **albicans** Grat. Shell entirely white or whitish without markings.

I have specimens from Freshwater and Yarmouth, Isle of Wight, and from Tenby, for which I am indebted to Mr. J. W. Wood, Mr. C. Ashford and Mr. Boland respectively.

Helix virgata m. **sinistrorsum** n. m. Shell reversed.

Mr. Ashford has found this form at Afton, Isle of Wight, and generously added it to the collection of the Conchological Society ; Mr. Peace has found it at Balne Moor, Yorkshire, and Mr. Norman at Clevedon.

Helix caperata var. **bizonalis** Moq. Shell whitish, with two continuous bands above the periphery, and many below.

I found a specimen of this variety at Scarborough.

Helix ericetorum var. **leucozona** Moq. Shell entirely rufous or brown above, with a white line at the periphery, often with many lines beneath.

Kindly given to me by Mr. Baillie of Brora, from near mouth of Halladale River, N. coast of Sutherland.

Balea perversa var. **simplex** Moq. Shell without denticle.

I have found this variety somewhat commonly at West Witton, N.W. Yorkshire.

Cochlicopa lubrica var. **minor** Fischer. Shell smaller. Length $4\frac{1}{2}$ mill.

Mr. Roebuck has kindly given me this variety collected by himself at Llandudno.

Cyclostoma elegans var. **marmorea** Brown. Shell smooth, and nearly entirely free from striation.

Mr. Ashford has kindly given me a specimen of this variety from Croydon, Surrey.

Neritina fluviatilis var. **cerina** Colbeau. Shell of a uniform straw-yellow color.

Found in the Avon canal near Bath, by Miss F. M. Hele, to whom science is indebted for many valuable discoveries, and to whose accustomed generosity I am indebted for specimens.

Valvata piscinalis m. **sinistrorsum** n. m. Shell reversed.

Found by Mr. Groves at Sunbury, and recorded by Dr. Jeffreys in the Ann. and Mag. Nat. Hist. for 1878.

Planorbis lineatus var. **albina** n. v. Shell milk white and semitransparent.

Found in ditches near Deal by Mrs. Fitzgerald, who has obligingly given me a specimen.

Planorbis complanatus m. **sinistrorsum** n. m. Shell reversed.

Miss F. M. Hele has been so fortunate as to find this at Wye, in Kent.

Septa of Planorbis lineatus.—Dr. Jeffreys (British Conchology, vol. i., p. 80) in speaking of this species says that the septa are "only formed in adult individuals." I have however found them in half-grown shells, and this observation was also made independently by Mr. Butterell and communicated to me. In some of the specimens the dried body of the animal had shrunk beyond the second septum. I have not noticed whether during life they have that power. Dr. Jeffreys remarks "that the septa form half closed chambers, and the animal retreats into the front one for safety."—J. W. TAYLOR.

THE BRITISH SLUG LIST.

By W. DENISON ROEBUCK.

[Read before the Conchological Society.]

We take advantage of the preparation of a new list of British mollusca to insert the names of such species and varieties of slugs as it seems desirable to include, making at the same time such corrections of nomenclature as will—without causing confusion—tend to bring our list more in accord with the present advanced state of limacology on the Continent. We abstain from doing more, as a complete revision of the nomenclature of this interesting group is not called for in a list, where it would only bewilder the student accustomed to use 'Jeffreys' or 'Rimmer' as his text-book. The subject has during the past twenty years received a considerable amount of attention at the hands of German, French, Italian and Swedish malacologists, but in these kingdoms there does not appear to have been a professed limacologist since the days of the Rev. B. J. Clarke. It is consequently on his valuable papers that most of the present additions to our list have been founded. The writers of manuals of British mollusca have for the most part ignored the variations of the slugs or treated the subject in a careless inaccurate way.

The most important modifications now introduced into the list are the adoption of the genus *Amalia* for the two keeled species of *Limax*, and the introduction of *Limax cinereo-niger* Wolf, a form now recognised as a valid and distinct species by all continental authorities.

The varieties now brought forward—few in comparison with those which further and more detailed study will bring under our notice—are merely colour-mutations, and have mostly been known as British for some time, though so far without names.

Arion ater var. **rufa** (L.). Animal red or brownish, unicolorous (Moquin-Tandon).

This form is probably of not unfrequent occurrence. The Rev. B. J. Clarke stated in 1840 that the "brown variety" seemed to predominate at Killereran, co. Galway. The Rev. J. McMurtrie informs me that "brownish-red specimens" are not uncommon in Scotland, as at Cumnock, Ayrshire, and Wishaw, Lanarkshire, and Mr. C. Ashford has told me of "light-red" examples occurring at Bettws-y-Coed in 1865.

Arion ater var. **succinea** Müll. Animal yellowish, unicolorous (Moquin-Tandon).

The Rev. B. J. Clarke (1840) stated that in Ireland he had never taken the "yellow variety" of the full size, and in this respect my own experience coincides. Yellow examples are not rare at Meanwood near Leeds, but generally small.

Arion ater var. **albolateralis** v. nov.

Animal black, sides and foot quite white, the two colours being sharply defined; foot with orange fringe.

Mr. C. Ashford found a specimen in 1865 at Bettws-y-Coed in Carnarvonshire which does not answer to any of the varieties described by Moquin Tandon, and which he described as above.

Arion ater var. **marginata** Moq.

Animal black, with border yellow, orange, or 'rouge de minium' (Moquin-Tandon).

Mr. William Thompson in his catalogue of Irish shells (1840) cited this variety as occurring commonly in fields about Cremorne, co. Monaghan, on the strength of a coloured drawing made by Mr. Templeton in 1805.

Arion ater var. **albida** v. nov. Animal entirely white.

The Rev. J. McMurtrie writes me that at the beginning of June last he found a full-grown pure white specimen of *A. ater* at Ambleside, Westmoreland.

Arion flavus. This is a form which requires investigation. Some of the continental authorities do not seem to recognize its claim to specific rank; as for instance, A. W. Malm, who, in his 'Skandinaviska Landsniglar,' gives *A. flavus* of Forbes and Hanley as a young example of the Continental *Arion fuscus*, and *A. flavus* of Nilsson and Von Martens he considers to be the young of *A. ater*.

I suspect some of the examples reported in local lists may be merely the yellow varieties of the other British species of *Arion*.

Arion hortensis var. **rufescens** Moq. Animal reddish with black bands (Moquin-Tandon).

A specimen was sent to me in May, 1883, from Ripon, by my friend Mr. A. E. Ebdell.

Genus **Amalia.**

This genus, which includes two British species, *A. gagates* and *A. marginata*, is readily distinguishable from *Limax* by its back being keeled throughout its length, by the shield being granulated or shagreened and not striated, by the shell being equilateral, and by the penis-sheath being composed of two distinct parts, an upper cylindrical one, and a globular one near the genital orifice. The latter is the anatomical character assigned to the genus by Sordelli, in his 'Anatomia del Limax Doriæ Bourg., nei suoi rapporti con altre specie congeneri' (1870).

Amalia gagates var. **plumbea** Moq. Animal black-grey, more or less lead coloured (Moquin-Tandon).

The specimens which Mr. C. Ashford has sent me from Christchurch, S. Hants, where they are not uncommon, were of this variety and were very constant in their coloration. The Rev. B. J. Clarke in 1840 noted that the majority of his Irish examples—found at La Bergerie in Queen's Co., Tuam in E. Galway, and Tourmakady in E. Mayo—were also of this variety.

Limax maximus var. **Ferrussaci** Moq. Animal with rounded black spots on the shield, and four rows of black points on the body (Moquin and Pini).

The Rev. B. J. Clarke in 1840 recorded specimens taken in the churchyard at Monivea, co. Galway, which closely resembled Férussac's fig. 8, var. ζ, beautifully and distinctly spotted, the ground colour not so light as in Férussac's figure.

Limus maximus var. **cinerea** Moq. Animal ash-coloured, without spots: shield bluish-black (Moquin-Tandon).

Found at Killereran, co. Galway—Rev. B. J. Clarke, 1840.

Limax cinereo-niger Wolf.

This form has usually been treated by conchologists as a variety of *L. maximus*, from which however it is now separated by the best continental authorities. It may be distinguished by the following external characters:—the shield is unicolorous without markings or only with slight traces towards the edge; the respiratory orifice is margined with the colour of the body, of a darker hue; the dorsal keel is in colour usually different from the general tint of the body; and the lower surface of the foot is divided longitudi-

nally into three differently coloured bands, the median one white, the two lateral ones dark.

There are also important differences between the two species in the genital apparatus.

Found by the Rev. B. J. Clarke in the Spire Hill, Queen's county, Ireland, and in county Cork by Mr. Robert Ball.

Limax cinereo-niger var. **nigra** Moq. Animal entirely deep black (Moquin-Tandon).

The Rev. A. Merle Norman, in his 'Inland Mollusca of Somersetshire' (1860) mentioned finding in Cleeve Combe an example which he described as "altogether pitchy black, without spot or marking of any kind, and fully six inches long."

Limax agrestis var **filans** Hoy. Animal greyish-white or ash-coloured; shield yellowish (Moquin-Tandon).

Originally described from British specimens. The Rev. B. J. Clarke found it equally common with the type in Queen's and Galway counties.

Limax agrestis var. **punctata** Picard. Animal greyish or white, with very small black points (Moquin-Tandon).

Ireland (Rev. B. J. Clarke, 1843).

Limax agrestis var. **lilacina** Moq. Animal lilac, reddish, or colour of the dregs of clear wine (Moquin-Tandon).

The Rev. B. J. Clarke speaks of a curious dark variety, of a uniform dark purplish or slate colour, which has not unfrequently occurred to him in Ireland, usually in company with the other varieties (Annals and Mag. Nat. Hist., 1843, xii. 338).

Limax agrestis var. **albida** Picard. Animal entirely white, without markings.

I found a beautiful white specimen of this species in April, 1883, at Bolton Abbey in Wharfedale, which was under a stone in company with the type.

Moquin-Tandon hardly appears to recognize the correct character of a var. *albida* when he assigns to it such a character as "Animal greyish-white without markings. Sometimes two scarcely perceptible lateral grey bands on the shield." I have not access to Picard's description, but should it agree with that of Moquin, my specimen will certainly require a new name.

DESCRIPTION OF A NEW SPECIES OF *CASSIS*.

By JAMES COSMO MELVILL, M.A., F.L.S.

Cassis kalosmodix Melvill, n. sp. Pl. i., fig. 1.

Shell oblong-ovate, rather thick, smooth, whitish tinged with blue on the upper whorls, and in the obscure bands across the body whorl, painted throughout with numerous longitudinal light brown or fulvous stripes, which are thicker and somewhat darker in crossing the transverse bands, the alternate ones passing into dark brown flames at the top of the whorls next the suture; spire elevated, slightly convex; upper whorls convexly rounded, penultimate sloping above, then swollen; last whorl convexly cylindrical; apex pink; aperture narrow above, moderately expanded below, in length rather more than two-thirds of the entire shell; interior smooth, tinged with brown; outer lip smooth, thickened white, marked externally

with transverse stripes of dark brown, arranged in pairs to correspond with the bands on the body whorl; columella furnished with a thick smooth white enamel, which is rounded near the umbilical region, and tinged with brown at the outer extremity, terminating in a strong oblique fold, above which are two or three minor folds passing into the interior of the shell.

Long. 90, lat. 47 mill.

This very handsome species, of which the type is in my collection, is nearly allied to *C. vibex* (L.), the meaning of which word is in fact retained in the word *kalosmodix* (Gr. κάλος, *pulcher*, and σμωδιξ, *vibex*). The principal difference is in the entire absence of spines on the outer lip, which is entirely smooth from end to end. The markings also are different in character and position from those of any *C. vibex* in existence.

There is a small specimen of *C. kalosmodix* in the British Museum, having similar markings and the same toothless smooth lip. Locality of both this and the type unknown, but most probably the species is a native of eastern seas.

Pupa marginata v. **albina.**—This pretty variety—which has hitherto been recorded only from Somersetshire, on the authority of Dr. Jeffreys and others, and Oxfordshire, by Mr. Whiteaves, but without precise localities being given in either case—has been discovered in Worcestershire by Mr. W. H. Boland of Birmingham, who has been fortunate enough to find it in some numbers at Cleeve Priors, thus adding another county to its known habitats.—JOHN W. TAYLOR.

THE CONCHOLOGICAL SOCIETY'S LIST OF BRITISH LAND & FRESHWATER MOLLUSCA.—1883.

The lapse of time since the publication of Jeffreys' 'British Conchology,' still our standard manual, and the number of forms lately added to the British fauna, has rendered necessary the preparation of a new list. The present one has therefore been drawn up by a committee appointed by the Conchological Society, consisting of Messrs. J. W. Taylor, W. Denison Roebuck and W. Nelson, with the president and secretary, and includes all forms which have so far been authenticated as British.

EXPLANATIONS.

The Arrangement is that of Dr. Jeffreys, the one familiar to British conchologists.

The Nomenclature is also in the main that of Dr. Jeffreys. It has been carefully examined and minor points revised, but the compilers have not felt themselves justified in making more than slight corrections, as the publication of a list of names is not a fitting occasion on which to introduce radical changes of nomenclature, or confusion would be the inevitable result.

The Authorities for Specific Names have been carefully revised, and the practice of enclosing them within parentheses has been adopted in the case of species which were originally described as of a different genus to that now used: *e.g.*, *Arion ater* (L.) was described as a *Limax*, while *Helix hispida* L. retains its original generic allocation.

Numbers and Letters.— For convenience in exchanging, the species included in the list are numbered consecutively throughout, and the varieties of each species are lettered, beginning with *b*, the type always being considered to be *a*.

Square Brackets [ ] are used to denote species whose claim to rank as British is not yet thoroughly established, as in the case of *Helix villosa*.

Monstrosities, although of no very great importance, are included in the list, placed after the varieties of each species,

and distinguished by 'm.' instead of 'v.' preceding the name. Under this denomination are included all abnormal forms, reversed, scalariform, decollated or distorted.

The Exclusions from the list are two species of *Clausilia*, *C. parvula* and *C. solida*, neither of which has the slightest claim to rank as British. *Helix hybrida* Poiret also disappears from the list, discarded on account of the confusion which the use of the name entails. For the future it will be more precise to refer specimens to the var. '*roseolabiata*' or '*fuscolabiata*' of *H. nemoralis* or *H. hortensis*, as the case may be.

Band-variation in Helix nemoralis and H. hortensis.—No philosophical plan of treating the numerous variations of these species has yet been propounded, and until such is the case it is deemed the wiser plan to include in the list only variations of size, form, texture, colour of lip and ground-colour. A convenient method or formula, however, exists by which band-variations may be readily and accurately recorded. As all conchologists know, the type form has five bands, each of which is constant in its position on the shell, three of them being always above, and two always below, the periphery. The variation is usually by suppression or by coalescence of one or more of these bands, or both. Numbering the bands for convenience 1, 2, 3, 4, 5, the uppermost being the first and the lowermost the fifth band, the formula for the type would be written thus: 12345. In the case of the suppression of a band, a cypher (0) is used in lieu of its number, thus—12045—signifying that the third band is deficient. The unicolorous form is a case of the suppression of the entire series of bands, and for this the formula is five cyphers, thus—00000. In the case of coalescence of one or more bands, the numbers standing for the coalesced bands are enclosed within parentheses, *e.g.*—(12)3(45), which signifies that the first and second bands are fused together, also the fourth and fifth, the third only being free. Any combination of these formulæ may be used, as for instance, (12)305 signifies the coalescence of the first and second, and the suppression of the fourth. The black specimens afford an instance of the coalescence of all five bands, for which the formula is written thus—(12345).

THE CONCHOLOGICAL SOCIETY'S LIST OF BRITISH LAND & FRESHWATER MOLLUSCA.—1883.

AQUATIC.

CONCHIFERA.

SPHÆRIIDÆ.

SPHÆRIUM *Scop.*

1 Sphærium corneum (*L.*).
- *b* v. flavescens (*Macgill.*).
- *c* v. nucleus (*Stud.*).
- *d* v. Scaldiana (*Norm.*).
- *e* v. Pisidioides *Gray.*

2 Sphærium rivicola (*Leach*).

3 Sphærium ovale (*Fer.*).

4 Sphærium lacustre (*Mull.*).
- *b* v. Brochoniana *Bourg.*
- *c* v. rotunda *Jeff.*
- *d* v. Ryckholtii (*Norm.*).

PISIDIUM *C. Pfeiffer.*

5 Pisidium amnicum (*Mull.*).

6 Pisidium fontinale (*Drap.*).
- *b* v. Henslowana (*Shepp.*).
- *c* v. pulchella *Jenyns.*
- *d* v. pallida *Gassies.*
- *e* v. cinerea *Alder.*

7 Pisidium pusillum (*Gmelin*).
- *b* v. obtusalis (*Lam.*).

8 Pisidium nitidum *Jen.*
- *b* v. splendens *Moq.*

9 Pisidium roseum *Scholtz.*

UNIONIDÆ.

UNIO *Philippsson.*

10 Unio tumidus *Phil.*
- *b* v. radiata *Colb.*
- *c* v. ovalis (*Mont.*).

11 Unio pictorum (*L.*).
- *b* v. radiata *Moq.*
- *c* v. curvirostris *Norm.*
- *d* v. latior *Jeff.*
- *e* v. compressa *Jeff.*

12 Unio margaritifer (*L.*).
- *b* v. sinuata *Lam.*
- *c* v. Roissyi *Mich.*

ANODONTA *Lam.*

13 Anodonta cygnea (*L.*).
- *b* v. radiata (*Mull.*).
- *c* v. incrassata (*Shepp.*).
- *d* v. Zellensis (*Gmel.*).
- *e* v. pallida *Jeff.*
- *f* v. rostrata *Rossm.*

14 Anodonta anatina (*L.*).
- *b* v. radiata *Jeff.*
- *c* v. ventricosa *C. Pfr.*
- *d* v. complanata *Rossm.*

DREISSENIDÆ.

DREISSENA *VanBen.*

15 Dreissena polymorpha (*Pall.*).

GASTROPODA.

NERITIDÆ.

NERITINA *Lam.*

16 Neritina fluviatilis (*L.*).
- *b* v. trifasciata *Colb.*
- *c* v. undulata *Colb.*
- *d* v. cerina *Colb.*
- *e* v. nigrescens *Colb.*

PALUDINIDÆ.

PALUDINA *Lam.*

17 Paludina contecta (*Millet*).
- *b* v. virescens *Jeff.*

18 Paludina vivipara (*L.*).
- *b* v. albida *N. & T.*
- *c* v. unicolor *Jeff.*
- *d* v. atro-purpurea *Lloyd.*

BYTHINIA *Gray.*

19 Bythinia tentaculata (*L.*).
- *b* v. ventricosa (*Menke*).
- *c* v. excavata *Jeff.*
- *d* v. albida *Rimmer.*
- *e* m. decollatum *Jeff.*

20 Bythinia Leachii (*Shepp.*).
- *b* v. elongata *Jeff.*
- *c* v. albida *Rimmer.*

VALVATIDÆ.

VALVATA *Mull.*

21 Valvata piscinalis (*Mull.*).
b v. depressa *C. Pfr.*
c v. subcylindrica *Jeff.*
d v. acuminata *Jeff.*
e v. pusilla (*Mull.*).
f m. sinistrorsum *Jeff.*

22 Valvata cristata *Mull.*

LIMNÆIDÆ.

PLANORBIS *Guettard.*

Segmentina Flem.

23 Planorbis lineatus *Walker.*
b v. albina *Taylor.*

Gyraulus Agassiz.

24 Planorbis nitidus (*Mull.*).
b v. albida *Nelson.*

25 Planorbis nautileus (*L.*).
b v. crista (*L.*).

26 Planorbis albus *Mull.*
b v. Draparnaldi (*Shepp.*).

27 Planorbis parvus *Say.* = P. glaber *Jeff.*
b v. compressa *Lloyd.*

28 [Planorbis dilatatus *Gould.*]

Gyrorbis Agassiz.

29 Planorbis spirorbis *Mull.*
b v. ecarinata *Jeff.*
c v. albida *Nelson.*

30 Planorbis vortex (*L.*).
b v. compressa *Mich.*

31 Planorbis carinatus *Mull.*
b v. disciformis *Jeff.*

32 Planorbis complanatus (*L.*).
b v. rhombea (*Turt.*).
c v. albina *Jeff.*
d m. sinistrorsum *Taylor.*

Coretus Adanson.

33 Planorbis corneus (*L.*).
b v. albinos *Moq.*

Bathyomphalus Agassiz.

34 Planorbis contortus (*L.*).
b v. albida *Jeff.*

PHYSA *Lamarck.*

Aplexus Flem.

35 Physa hypnorum (*L.*).
b v. major *Charp.*
c m. decollatum *Nelson.*

Bulinus Adanson.

36 Physa fontinalis (*L.*).
b v. inflata *Moq.*
c v. curta *Jeff.*
d v. oblonga *Jeff.*
e v. albina *Jeff.*

LIMNÆA *Bruguiere.*

Amphipeplea Nils.

37 Limnæa glutinosa (*Mull.*).
b v. mucronata *Jeff.*

Radix Montfort.

38 Limnæa involuta *Thompson.*

39 Limnæa peregra (*Mull.*).
b v. Burnetti *Alder.*
c v. lacustris (*Leach*).
d v. lutea (*Mont.*).
e v. ovata *Drap.*
f v. acuminata *Jeff.*
g v. intermedia *Fer.*
h v. oblonga *Jeff.*
i v. labiosa *Jeff.*
j v. picta *Jeff.*
k v. maritima *Jeff.*
l v. lineata *Bean.*
m v. candida *Porro.*
n v. succineæformis *Jeff.*
o m. sinistrorsum *Jeff.*
p m. scalariforme *Jeff.*
q m. decollatum *Jeff.*

40 Limnæa auricularia (*L.*).
b v. magna *Colb.*
c v. minor *Moq.*
d v. acuta *Jeff.*
e v. ampla (*Hartm.*).
f v. reflexa *Nelson.*
g v. albida *Jeff.*

Limnophysa Fitzinger.

41 Limnæa stagnalis (*L.*).
b v. fragilis (*L.*).
c v. labiata *Jeff.*
d v. roseolabiata *Sturm.*
e v. albida *Jeff.*
f m. sinistrorsum *Jeff.*

42 Limnæa palustris (*Mull.*).
b v. corvus (*Gmel.*).
c v. minor *Taylor.*
d v. elongata *Moq.*
e v. conica *Jeff.*
f v. tincta *Jeff.*
g v. lacunosa *Zgl.*
h v. fasciata *Nelson.*
i v. roseolabiata *Jeff.*
j v. albida *Nelson.*
k m. decollatum *Jeff.*

43 Limnæa truncatula (*Mull.*).
b v. major *Moq.*
c v. minor *Moq.*
d v. ventricosa *Moq.*
e v. elegans *Jeff.*
f v. microstoma *Drouet.*

g v. albida *Jeff.*
h m. scalariforme *Jeff.*

Omphiscola Beck.

44 Limnæa glabra (*Mull.*).
b v. major *Gassies.*
c v. elongata *Jeff.*
d m. decollatum *Nelson.*

ANCYLUS *Geoffroy.*

45 Ancylus fluviatilis *Mull.*
b v. capuloides *Jan.*
c v. gibbosa *Bourg.*
d v. albida *Jeff.*

Velletia Gray.

46 Ancylus lacustris (*L.*).
b v. compressa *Jeff.*
c v. Moquiniana *Bourg.*
d v. albida *Jeff.*

TERRESTRIAL.

ARIONIDÆ.

ARION *Ferussac.*

47 Arion ater (*L.*).
b v. rufa (*L.*).
c v. succinea (*Mull.*).
d v. marginata *Moq.*
e v. albolateralis *Roebuck.*
f v. albida *Roebuck.*

48 Arion hortensis *Fer.*
b v. rufescens *Moq.*

49 [Arion flavus (*Mull.*).]

GEOMALACUS *Allman.*

50 Geomalacus maculosus *Allman.*

LIMACIDÆ.

AMALIA *Moq.*

51 Amalia gagates (*Drap.*).
b v. plumbea *Moq.*

52 Amalia marginata (*Mull.*).

LIMAX *Linne.*

53 Limax maximus *L.*
b v. cinerea *Moq.*
c v. Ferrussaci *Moq.*

54 Limax cinereo-niger *Wolf.*
b v. nigra *Moq.*

55 Limax flavus *L.*

56 Limax agrestis *L.*
b v. filans *Hoy.*
c v. punctata *Moq.*
d v. nigra *Butterell.*
e v. lilacina *Moq.*
f v. albida *Picard.*

57 Limax lævis *Mull.*

58 Limax tenellus *Mull.*

59 Limax arborum *B.-Ch.*

TESTACELLIDÆ.

TESTACELLA *Cuv.*

60 Testacella haliotidea *Drap.*
b v. scutulum *Sow.*

61 Testacella Maugei *Fer.*

HELICIDÆ.

SUCCINEA *Drap.*

62 Succinea putris (*L.*)
b v. subglobosa *Jeff.*
c v. solidula *Jeff.*

63 Succinea virescens *Morelet.*
(= S. putris v. vitrea *Jeff.*).

64 Succinea elegans *Risso.*
b v. minor *Jeff.*
c v. ochracea *Betta.*
d v. albida *Taylor.*
e m. sinistrorsum *Baud.*

65 Succinea oblonga *Drap.*

VITRINA *Drap.*

66 Vitrina pellucida *Mull.*
b v. depressiuscula *Jeff.*
c v. Dillwynii *Jeff.*

ZONITES *De Montfort.*

67 Zonites cellarius (*Mull.*).
b v. complanata *Jeff.*
c v. compacta *Jeff.*
d v. albinos *Moq.*

68 Zonites alliarius (*Miller*).
b v. viridula *Jeff.*

69 Zonites glaber (*Stud.*).

70 Zonites nitidulus (*Drap.*).
b v. nitens (*Mich.*).
c v. Helmii (*Alder*).

71 Zonites purus (*Alder*).
b v. margaritacea *Jeff.*

72 Zonites radiatulus (*Alder*).
b v. viridescenti-alba *Jeff.*

73 Zonites nitidus (*Mull.*).
b v. albinos *Moq.*

74 Zonites excavatus (*Bean*).
b v. vitrina (*Fer.*)

75 Zonites crystallinus (*Mull.*).
b v. complanata *Jeff.*

Conulus Fitzinger.

76 Zonites fulvus (*Mull.*).
b v. Mortoni (*Jeff.*).
c v. Alderi (*Gray*).
d v. viridula *Taylor.*

HELIX *L.*

Acanthinula Beck.

77 Helix lamellata *Jeff.*
78 Helix aculeata *Mull.*
b v. albida *Jeff.*

Pomatia Leach.

79 Helix pomatia *L.*
b v. albida *Moq.*
80 Helix aspersa *Mull.*
b v. minor *Moq.*
c v. conoidea *Picard.*
d v. globosa *Moq.*
e v. tenuior *Shuttl.*
f v. nigrescens *Moq.*
g v. grisea *Moq.*
h v. unicolor *Moq.*
i v. albofasciata *Jeff.*
j v. zonata *Moq.*
k v. exalbida *Menke.*
l m. scalariforme *Taylor.*
m m. sinistrorsum *Taylor.*

Tachea Leach.

81 Helix nemoralis *L.*
b v. major *Fer.*
c v. minor *Moq.*
d v. roseolabiata *Taylor.*
e v. albolabiata *Von Mart.*
f v. bimarginata *Moq.*
g v. libellula *Risso.*
h v. rubella *Moq.*
i v. castanea *Moq.*
j v. olivacea *Gassies.*
k v. hyalozonata *Taylor.*
l m. scalariforme *Taylor.*
82 Helix hortensis *Mull.*
b v. minor *Moq.*
c v. roseolabiata *Taylor.*
d v. fuscolabiata *Von Mart.*
e v. albina *Moq.*
f v. lutea *Moq.*
g v. incarnata *Moq.*
(=fagorum *Weinl.* & *V. M.*)
h v. olivacea *Taylor.*
i v. lilacina *Taylor.*
j v. arenicola *Macgill.*
k m. sinistrorsum *Taylor.*

Arionta Leach.

83 Helix arbustorum *L.*
b v. major *Pfr.*
c v. minima *Pfr.*
d v. alpestris *Ziegl.*
e v. conoidea *Westerl.*
f v. fusca *Fer.*
g v. Repellini *Charp.*
h v. marmorata *Taylor.*
i v. pallida *Taylor.*
j v. flavescens *Moq.*
k v. albinos *Moq.*

Fruticicola Held.

84 Helix Cantiana *Mont.*
b v. rubescens *Moq.*
c v. galloprovincialis *Dup.*
d v. albida *Taylor.*
85 Helix Cartusiana *Mull.*
b v. leucoloma *Stabile.*
c v. rufilabris *Jeff.*
86 Helix rufescens *Penn.*
b v. minor *Jeff.*
c v. rubens *Moq.*
d v. alba *Moq.*
87 Helix concinna *Jeff.*
b v. minor *Jeff.*
c v. albida *Jeff.*
88 Helix hispida *L.*
b v. subrufa *Moq.*
c v. nana *Jeff.*
d v. subglobosa *Jeff.*
e v. depilata *Alder.*
f v. conica *Jeff.*
g v. albida *Jeff.*
89 Helix sericea *Mull.*
b v. cornea *Jeff.*
c v. carinata *Taylor.*
90 [Helix villosa *Drap.*]
91 Helix revelata *Mich.*
92 Helix fusca *Mont.*

Euparypha Hartm.

93 Helix Pisana *Mull.*
b v. lineolata *Moq.*
c v. alba *Shuttl.*

Xerophila Held.

94 Helix virgata *DaCosta.*
b v. major *Taylor.*
c v. minor *Taylor.*
d v. subaperta *Jeff.*
e v. subglobosa *Jeff.*
f v. carinata *Jeff.*
g v. nigrescens *Grat.*
h v. leucozona *Taylor.*
i v. submaritima *DesMoul.*
j v. hypozona *Moq.*
k v. subalbida (*Poiret*).
l v. albicans *Grat.*
m v. alba *Taylor.*
n m. sinistrorsum *Taylor.*
95 Helix caperata *Mont.*
b v. major *Jeff.*
c v. Gigaxii *Charp.*
d v. subscalaris *Jeff.*
e v. ornata *Picard.*
f v. bizonalis *Moq.*

g v. fulva *Moq.*
h v. alba *Picard.*
i v. obliterata *Picard.*

96 Helix ericetorum *Mull.*
b v. minor *Moq.*
c v. instabilis *Ziegl.*
d v. leucozona *Moq.*
e v. alba *Charp.*
f m. sinistrorsum *Jeff.*

Patula Held.

97 Helix rotundata *Mull.*
b v. minor *Jeff.*
c v. pyramidalis *Jeff.*
d v. Turtoni *Flem.*
e v. alba *Moq.*

98 Helix rupestris *Drap.*
b v. viridescenti-alba *Jeff.*

99 Helix pygmæa *Drap.*

Vallonia Risso.

100 Helix pulchella *Mull.*
b v. costata *Mull.*

Campylæa Beck.

101 Helix lapicida *L.*
b v. minor *Moq.*
c v. albina *Menke.*

Gonostoma Held.

102 Helix obvoluta *Mull.*

BULIMUS *Scopoli.*
Cochlicella Risso.

103 Bulimus acutus (*Mull.*).
b v. inflata *Moq.*
c v. bizona *Moq.*
d v. strigata *Menke.*
e v. articulata *Lam.*
f v. nigrescens *Taylor.*
g v. alba *Requien.*

Napæus Albers.

104 Bulimus montanus *Drap.*
b v. albinos *Moq.*

105 Bulimus obscurus (*Mull.*).
b v. albinos *Moq.*

Opeas Albers.

106 [Bulimus Goodallii *Mull.*]

PUPA *Lam.*
Torquilla. Studer.

107 Pupa secale *Drap.*
b v. edentula *Taylor.*
c v. Boileausiana *Charp.*
d v. alba *Jeff.*

Lauria Gray.

108 Pupa ringens *Jeff.*
b v. pallida *Jeff.*

109 Pnpa umbilicata *Drap.*
b v. edentula *Moq.*
c v. Sempronii *Charp.*
d v. albina *Moq.*

Pupilla Gray.

110 Pupa marginata *Drap.*
b v. bigranata *Rossm.*
c v. edentula *Moq.*
d v. albina *Menke.*

VERTIGO *Mull.*
Isthmia Gray.

111 Vertigo antivertigo (*Drap.*).
b v. octodentata *Stud.*

112 Vertigo Lilljeborgi *Westerlund.*
(=Moulinsiana *Jeff.* non *Dup.*)
b bidentata *Jeff.*

113 Vertigo Moulinsiana (*Dup.*) non *Jeff*

114 Vertigo tumida *Westerlund.*

115 Vertigo pygmæa (*Drap.*).
b v. pallida *Jeff.*
c v. quadridentata *Stud.*

116 Vertigo alpestris *Alder.*

117 Vertigo substriata (*Jeff.*).

Vertilla Moquin-Tandon.

118 Vertigo pusilla *Mull.*

119 Vertigo angustior *Jeff.*

120 Vertigo edentula (*Drap.*).
b v. columella (*VonMart.*).

121 Vertigo minutissima (*Hartm.*).

BALEA *Prideaux.*

122 Balea perversa (*L.*).
b v. viridula *Jeff.*
c v. simplex *Moq.*

CLAUSILIA *Drap.*
Iphigena Gray.

123 Clausilia rugosa (*Drap.*).
b v. dubia *Drap.*
c v. Everetti (*Miller.*)
d v. gracilior *Jeff.*
e v. tumidula *Jeff.*
f v. Schlechtii *Zelebor.*
g v. albinos *Moq.*
h m. dextorsum *Jeff.*

124 Clausilia Rolphii *Gray.*
b v. pellucida *Taylor.*

125 Clausilia biplicata (*Mont.*).
b v. Nelsoni *Jeff.*

Marpessa Gray.

126 Clausilia laminata (*Mont.*).
b v. pellucida *Jeff.*
c v. albinos *Moq.*

COCHLICOPA *Fer.*
Azeca Leach.

127 Cochlicopa tridens (*Pult.*).
b v. Nouletiana (*Dup.*).
c v. Alzenensis *St. Simon.*
d v. crystallina (*Dup.*).
e m. sinistrorsum *Taylor.*

Zua Leach.

128 Cochlicopa lubrica (*Mull.*).
b v. minor *Fischer.*
c v. lubricoides *Fer.*
d v. ovata *Jeff.*
e v. fusca *Moq.*
f v. hyalina *Jeff.*
g v. viridula *Jeff.*

ACHATINA *Lam.*

129 Achatina acicula (*Mull.*).

CARYCHIUM *Mull.*

130 Carychium minimum *Mull.*

CYCLOSTOMA *Montf.*

131 Cyclostoma elegans (*Mull.*).
b v. marmorea *Brown.*

ACME *Hartmann.*

132 Acme lineata (*Drap.*).
b v. alba *Jeff.*
c m. sinistrorsum *Jeff.*

Descriptions

of the species and varieties included in the foregoing list will be found in the following works :—

Jeffreys' British Conchology, vol. i. 1862, and vol. v. 1869.

Gray's Edition of Turton's Manual, 1857.

Reeve's British Land and Freshwater Mollusks, 1863.

Rimmer's Land and Freshwater Shells of the British Isles, 1880.

Nelson and Taylor in the Conchological Transactions of the Yorkshire Naturalists' Union, 1880, i. 27.

Jeffreys, in the Annals and Mag. of Nat. History, 1878, pp. 377—382.

Taylor, on the Life History of *Helix Arbustorum*, in the Journal of Conchology, iii. 246—250.

Taylor, Nelson, Roebuck, and Butterell, in the Journal of Conchology, iv. pp. 25 to 43 (1883).

Macgillivray's History of the Molluscous Animals of the Counties of Aberdeen, Kincardine, and Banff, 1843, p. 83.

The varieties of *Helix aspersa* will be described in Mr. Taylor's forthcoming Life History of that species in the Journal of Conchology.

DESCRIPTIONS OF NEW VARIETIES OF BRITISH LAND SHELLS.

By J. W. TAYLOR.

Helix nemoralis var. **olivacea** Gassies. Shell of a dark olive colour=v. *gesneria* Moq-Tand.

Miss F. M. Hele has kindly sent me specimens from Blagdon, Somersetshire.

Helix nemoralis m. **scalariforme** Fér. Shell with the whorls separated.

The Rev. W. C. Hey has found this form at Carnaby, Yorkshire.

Helix hortensis var. **albina** Moq. Shell white.

Mr. Nelson has found this at Warwick, and Miss F. M. Hele at Bilton, near Bath.

Helix cartusiana var. **leucoloma** Stabile. Shell small, with white peristome and rib.

Mrs. Fitzgerald has with her usual generosity given me specimens of this variety from Beechborough near Folkestone.

Bulimus montanus var. **albinus** Moq.=v. *pallescens* Jeff. Shell uniformly whitish.

I have found this variety at Cooper's Hill, Cheltenham, in company with the typical form.

Pupa umbilicata var. **Sempronii** Charp. Shell smaller, aperture without denticle, lip not so white.

I have found this variety on the slopes of Penyghent, Yorks.

Vertigo pygmea var. **quadridentata** Studer. Shell with only two palatal plications.

This variety is found at Dirtcar near Wakefield.

Vertigo antivertigo var. **octodentata** Studer. Aperture with eight denticles.

Dr. Gray mentions the occurrence of this variety, but does not give locality (Gray's Turton, p. 204).

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting,

HELD JANUARY 25TH, 1883.

Mr. J. W. Taylor was voted to the Chair. Correspondence was submitted from the President, Dr. W. H. Evans, and Messrs. W. Jeffery, J. W. Cundall, R. Scharff and E. Collier. Mr. Collier wrote:—"In exchanging shells I often receive *Pisidium* and *Sphærium* with both valves separated, and in such cases the right ones cannot well be put together. The method I adopt for my own cabinet is as follows:—Having placed my shells in a basin, I pour over them water sufficiently warm to cause the shell to open, and after extracting the animal (even in such species as *Pisidium pusillum* it can easily be done) screw up the shells singly in small pieces of thin tissue paper, so that when dry, which will not take more than two or three days, the valves will be closed as in life. I have found this plan to answer perfectly even for *S. corneum* and *S. ovale*. *S. rivicola*, I find, answer best to be tied up with thread."

NEW MEMBER.

Mr. J. Morgan of Sutton, was elected a member of this Society.

PAPER READ.

A Paper on the Land Shells of Gibraltar, by Dr. Kobelt of Schwanheim, translated from the German for the Society by Mr. R. Scharff. The thanks of the meeting were voted to Dr. Kobelt for his valuable communication, and to Mr. Scharff for the translation.

SPECIMENS EXHIBITED.

The Chairman, on behalf of Mr. Hagger of Repton, showed a number of varieties of *Helix nemoralis* and *H. hortensis;* also varieties of *Helix aspersa* from Folkestone, Faversham and *Droitwich, from* Miss Fairbrass of Faversham.

Mr. W. D. Roebuck exhibited a number of living slugs, including *Arion hortensis*, *Amalia gagates*, *A. marginatus*, *Limax flavus*, *L. agrestis* and *L. maximus*, sent by Mr. C. Ashford from Christchurch. Several of the specimens were of anomalous colouration, particularly the *Arion* and the *Limax maximus;* and Mr. Roebuck pointed out that a great deal of work required to be done before it could be said that the latter species was well known, and particularly directed the attention of members to the fact that while Moquin-Tandon laid much stress on the importance of the bi-centrical arrangement of the striæ on the shield of *L. maximus*, considering it peculiar to and characteristic of the species, the character could not be detected at all in Mr. Ashford's English examples; thus raising doubts as to whether the character possesses the value attached to it by Moquin-Tandon.

On behalf of Mr. Ingleby of Eavestone, near Ripon, a number of shells were shown which had been collected in that neighbourhood.

Meeting,

HELD FEBRUARY 22ND, 1883.

Mr. J. W. Taylor presided. Minutes of January meeting were read and confirmed. The following

DONATIONS

were announced:—The Proceedings of the Linnean Society, New South Wales, vol. vii., part 3, from the Society; The Transactions of the Yorkshire Naturalists' Union, part 4, from the Union; The Scientific Roll, vol. i., part 2, No. 10, by the Editor (Alexander Ramsay, F.G.S.).

SPECIMENS EXHIBITED.

Mr. Taylor exhibited a large number of British and Continental varieties of *Helix arbustorum* and *H. nemoralis*; also numerous other species. Mr. Roebuck showed specimens of *Tryphæna Horei*, *Trochus* sp.? and *Achatina* sp.?, from Lake Tanganyika; also a series of shells from Yorkshire localities, on behalf of Mr. J. Ingleby.

NOTES ON THE MOLLUSCA COLLECTED IN SWITZERLAND IN 1882.

By R. M. CHRISTY.

It is hard to believe that among the many thousands of Englishmen annually visiting the Engadine and other parts of Switzerland, there are not a few at least who have some acquaintance with the mollusca inhabiting those regions. Having spent two months at St. Moritz this summer, I trust a few remarks on the species I met with will prove of interest. In identifying my specimens I have received the very kindest assistance from Miss F. M. Hele of Bristol. An uphill journey by a Swiss Diligence allows ample time for one to botanize, entomologize or to hunt for shells by the roadside, and the first opportunity I found for doing the latter was during the Diligence journey from Chur, viâ Thusis and the Julier Pass to the Engadine, on the 30th of June last. On this occasion I found *Helix pomatia* abundant about Thusis, and even almost as high up as Tiefenkasten, but after that I saw nothing of it, as it did not appear to inhabit any part of the Engadine. Between the above-mentioned places too, *Helix arbustorum* was common. The specimens were much lighter in colour than is usual, but from their size I believe they are not the variety *alpestris*.

St. Moritz is at a height of 6100 feet above the sea, and is the highest village in the Engadine. It is no wonder, therefore, that its neighbourhood does not afford a very large list of shells. Indeed, I had been there some days before I noticed any, but then I found that a fall of rain had brought out a few individuals of *Helix arbustorum* beside the small stream running down beside the path to Celerina. Then again came a period when I met with nothing, until on the 19th of June I went for a short distance up the little stream which runs down through the meadows on the mountain-side, immediately above the Kulm

Hotel. Here I found several sorts living among the roots of the grass, &c., just on the edge of the stream, where the splashing of the water kept everything moist. Away from the stream I could find no shells, but close to it *Cochlicopa lubrica* and *Pupa marginata* lived sparingly, with a very few minute *Vertigos*. I got one or two specimens of a *Succinea* (*?putris*), but *S. oblonga*, both alive and dead, abounded, and many of the specimens were very fine. There were many dead shells of this species which were quite white, but I found one specimen alive that had a pure white shell. *Helix arbustorum* var. *alpestris* (or a variety approaching it) was very common up the sides of the stream wherever the spray kept the grass moist, for a considerable distance, perhaps 700 feet above the Hotel. *Lymnæa peregra* var. *decollata* was very common adhering to stones in the Silser See or Sils Lake, the Kampfer Lake and the Lake of St. Moritz, as well as in the River Inn which runs through and connects all the above lakes. This species was the only one I could detect in the Lake of St. Moritz, but in the Kampfer Lake I found a number of dead specimens of *Planorbis spirorbis*. In the Statz Lake I could not find any shells whatever. It is the small lake alongside of which the foot-path to Pontresina runs. It is situated in the pine forest and is about a quarter of a mile from the Lake of St. Moritz, though about 50 feet higher, and the river does not run through it. The pine forests seemed as if they were absolutely shell-less until on the 9th of August I found, by careful searching among the roots of the grass, a few specimens of a small *Vitrina* and an unidentified *Limax* about an inch long. I noticed in several instances, as I have done with other species in England, that two individuals were lying together—I suppose so that as little as possible of the moisture of their bodies should be lost. I also met with *V. pellucida*, I believe, on one occasion. I did not see any other species away in the forests. A small expanse of mud beside the river became uncovered when the water got low about the end of August, when most of the snow on the

mountains was melted, and the sun's heat was not sufficient to melt what little there was left, here I found a plentiful supply of small *Lymnæa truncatula* and *Succinea elegans*, while *Planorbis rotundatus* was common in a dried-up ditch close at hand. On the 11th of August I obtained, by careful searching in cracks and among the roots of the tufts of grass, a good number of *Balea perversa* and *Pupa marginata* on a small face of rock above the gorge through which the Inn flows after having left the lake at the falls. *Helix obvoluta* lived sparingly among the *débris* of loose pieces of rock near the same spot, and in several other spots about St. Moritz. Empty shells of this species seemed always to be commoner than live ones. On the 23rd, during an expedition to the Roseg Glacier, I ascended the side of the mountain near the glacier to a height of perhaps 7000 ft. On my way I found beneath stones in the open a few specimens of *Cochlicopa lubrica*, a *Zonites* (resembling *fulvus*) and a fair number of what I believe to be *Zonites excavatus*. I also found a few specimens of this near St. Moritz, as well as some small whitish shells which Miss Hele believes to resemble *Z. radiatulus* var. *viridescenti- alba*. A small ditch in the meadows below Celerina (into which I believe some of the drains of the village run) supplied me with a curious variety of *L. peregra*. The shells were of a good size and not altogether unlike *L. palustris*. In the same locality I met with a few *L. truncatula* and *S. elegans*. The foregoing list of 20 species or thereabouts, includes all the mollusca which I met with during the two months I spent in the Engadine. Doubtless with more attention bestowed upon conchology I might have found more sorts, but I was busy collecting in other branches of natural history. The great elevation of the district, however, would preclude a very extended list, but I was surprised that, in spite of a careful and repeated search, I met with none of the species of *Clausiliæ* which are so common in the lower parts of Switzerland. The number of *Helices*, too, might I should think be easily increased, as it only includes, at present *H. obvoluta* and the hardy *H.*

arbustorum. Some of the larger bivalves very possibly inhabit the lakes, but unfortunately I had no dredge to obtain them. On the whole it may be noticed that the species inhabiting this high Alpine locality do not differ greatly from those to be found in our own country. So far as climate goes I may say that we found this summer to be somewhat wetter and far colder than an average English summer, but the weather over the whole of Switzerland has been this year exceptionally bad. There are limestone rocks among various others in the vicinity of St. Moritz.

On the 14th of September we left the Engadine to spend a few weeks in the lower parts of Switzerland where shells are to be met with in larger numbers, and I think one or two remarks on the few I met with will not be out of place. We crossed the Julier Pass in a soaking rain, and whilst the Diligence horses were being changed I found plenty of *Clausilia biplicata* upon a wet wall close at hand. Next day I got plenty more of the same with *H. pomatia* and large darkly coloured *H. arbustorum* in the garden of the Hotel Via Mala at Thusis. During the morning we drove up the Via Mala. This stupendous gorge is I think the most wonderful place I have ever seen. It is I suppose in reality a deep "canõn," which in the course of time has been sawn out of the soft shaly rock by the rushing Hinter Rhein, until its sides are in places 1500 feet high. The road runs at first along the left side, and in one place a tunnel has been cut with infinite trouble to accomodate it through a projecting spur of rock. Three times the sides of this tremendous gorge approach each other near enough to be bridged, and the abyss below each of these bridges is marvellous, especially that below the third, where the river several hundred feet below runs along a mere crack but a few yards wide. The Via Mala is the commencement of the Splügen Pass on the Swiss side, and derives its name from the fanciful idea that on account of its wild and gloomy appearance it is the way to Hell. However this may be I found plenty of shells on the wet rocks

beside the road, notably *Clausilia biplicata* and *C. dubia* in plenty, with abundance of *H. rupestris* and some of what I presume were *Pupa avenacea*. On the 8th we drove from Dissentis through the Lukmannier Pass, which somewhat resembles the Via Mala but is far less grand. I counted no less than ten tunnels (some of them of fair length) through which the road passed in the course of a mile. Here I met with *Clausilia plicatula* but not in large numbers. Several days later, after having been snowed up at Zermatt and only escaping with difficulty, we arrived at Geneva, in which neighbourhood, among other species, *Clausilia parvula* seemed common on walls. I met with the same commonly at Lausanne and also at Lucerne, where in the "Gletscher-Garten" I found it on moist rocks with *C. biplicata* and *C. dubia* mixed. From Ouchy we of course went to visit the Castle of Chillon. *Pupa avenacea* and *Clausilia plicatula* were very abundant on the walls of the castle with a few *Helix lapicida*, while from Lucerne we of course went up the Rigi. Here at a height of about 6000 feet I found plenty of *H. arbustorum*, most of the specimens having very thin shells, and also a good number of *H. villosa*.

CIRCE *VERSUS* GOULDIA.

By PROF. W. H. DALL,
SMITHSONIAN INSTITUTION, WASHINGTON, D.C.

No. 10 of vol. iii. is at hand with the observations of my friend Mr. Boog Watson on the subject of "Circe *versus* Gouldia." The old parable of the Gold and Silver Shield is not necessary to teach us that there are different ways of looking at a fact or collection of facts. It seems to me that a little more illumination on this subject will do no harm, and I would beg space for it in your columns. Part of the difference of our points of view consists in the different ways in which my friend Watson and I regard the subject of nomenclature. This difference I cannot hope to reconcile and therefore on that side we

must agree to differ. A good deal of investigation into that topic has impressed me that, until the nomenclature of mollusks is in better state, no *general* advance in interest in systematic malacology or ease in grasping its principles can be hoped for. Consequently I am (perhaps too much) inclined to insist on a strict construction of the "Rules," no matter what familiar names suffer. Only, as our western miners have it, "when we get down to bed rock," in this way can uniformity be hoped for and the nomenclature serve its only legitimate purpose, that of a consistent index to the organisms it is applied to. Absolute values differ with different students. One speaks of a certain group as a family and a genus; another as a sub-family and a sub-genus. One says this is a species; another claims the organism as a variety: still another believes it an aggregation of several specific forms. This is inevitable, and all we can expect of students is a general agreement in relative values. That one man's genus and species and variety shall bear such a relation to one another as the other man's sub-family, sub-genus, and group of species or what not. In most cases the general idea of what constitute a species is pretty uniform, but it is quite the other way in regard to sub-genera and genera. This is so well known that few, if any, naturalists may be found who would claim that *so far as nomenclature is concerned* it makes any difference iu the treatment of a name whether it was proposed as a sub-genus or a genus. In any case the student will classify it as he estimates its rank: one in one category, others in the other category.

Now, as I understand the case of *Gouldia*, it is this. Dr. Gould's name was attached to two species of small bivalve shells by Prof. Adams at a certain date. He designated neither as the type, but in accordance with the practice of naturalists I have taken the first, largest, and most conspicuous species of the two as a type. If there was any one thing new in the group which had not before been generically distinguished it was entitled to bear the name of *Gouldia*. If there was more than

one there would be room for another name; if there was nothing new *Gouldia* would become a synonym. Now *Gouldia* has been in continuous use and familiarity with American students at least (and also many foreign ones) from the time it was proposed up to this hour. Carpenter had pointed out that part of the shells which had been described (after the first two, as well as one of those) were little crassatellas and must be eliminated. He also shewed that "*Circe*" *minima* belonged with the typical *Gouldia cerina*. But no one else meddled with the subject until Mr. E. A. Smith began to study it. Everybody on this side of the water had continued to confound the two kinds under the old and familiar name because no one had occasion to look into the matter particularly. But the name *Gouldia* had been called in question on other grounds, namely that there was a genus of birds of similar title described before that of Prof. Adams. The original place where *Gouldia* C. B. Adams was described had been forgotten (it was in an obscure pamphlet) and none of the nomenclators stated it rightly. It happened that I came across the name and took the opportunity of recording a fact about which enquiries had been made by several naturalists and thus put *Gouldia* Adams on a firm basis as regards its antagonism with the ornithic *Gouldia*, which I showed to be of later date.

Now it happens that after *Gouldia* Adams had been proposed and published and come into use Mörch proposed *Lioconcha* (without any limitation or diagnosis) in an auctioneer's catalogue of a shell collection. The group which we may suppose him to have had in view, from the species to which he attached the name, consists apparently of nothing but large Gouldias which had stupidly been included with *Circe* up to that time. No one, so far as I know, has doubted the propriety of separating these shells by name from *Circe*, but we must await a satisfactory description of the soft parts before the exact relations of *Circe* can be decided, or the relative value and nearest connections of either be determined finally. Now

if there is anything final or decisive in nomenclature, it seems to me that this case is perfectly clear. The newer name must give way. The newer name is *Lioconcha*; about this there is no doubt. There is no doubt that *Gouldia* Adams was properly proposed, described, and published. There is no doubt that the new thing in the pair of organisms included by the describer under his name was a shell which (except in size) does not differ from the species called *Lioconcha* by Mörch.

From my point of view I cannot see that the absolute rank assigned to the name has anything to do with the question any more than that "patriotism" with which my friend has (I hope and believe not mistakenly) endowed me.

It is true, as a conchologist and pupil of that loveable and wise old man whose name is thus perpetuated, I felt pleasure in firmly establishing its claim to priority, just as an ornithologist would if it had been the distinguished artist and naturalist who gave us the marvellous "Humming-birds." It is perhaps to my expression of this natural pleasure that Mr. Watson refers jocosely. However it is hardly necessary to say that systematic biology, like mathematics, occupies a position which can in no way be affected by political geography any more than it should be by considerations of familiarity with wrong uses of names.

BIBLIOGRAPHY.

Les Mollusques Marins du Rousillon. Descriptions et Synonymie (The Marine Mollusca of Rousillon, France, with descriptions and synonymy). — By E. Bucquoy, Ph. Dautzenberg and G. Dollfus. Fascicules 2 and 3.

The second fascicule is devoted to the families Buccinidæ and Coninæ, embracing the genera *Nassa*, *Amycla*, *Neritula*, *Purpura*, *Cassis*, *Cassidaria*, *Columbella* and *Conus*. A new subgenus, *Columbellopsis*, is erected for *C. minor* Scacchi. Three

new varieties of *Nassa incrassata* are described and figured (vars. *minor*, *elongata* and *varicosa*). *Nassa pygmæa* has two new varieties—*elongata* and *evaricosa*. Of *Nassa reticulata* three new varieties are established—*curta*, *rosea* and *depicta*.

The whole of the species treated of are examined in a philosophical way in regard to their variations, which are arranged with reference to their form, color or substance. We must continue to express our appreciation of the exellence of this work, and the satisfactory character of the plates with which it is embellished.

The third fascicule of this beautiful work is to hand and treats upon the Pleurotominæ, and contains the genera *Pleurotoma*, *Clathurella*, *Raphitoma* and the two new genera, *Hædropleura* Monterosato MSS., and *Donovania* B., D. and D. The genus *Pleurotoma* is divided into the subgenera *Teres* B., D. and D., and *Bellardia*, B., D. and D.; *Pleurotoma anceps* being the type of the former, and *Pleurotoma gracile* of the latter. A new subgenus of *Mangilia* is also proposed—*Mangiliella* B., D. and D. —of which *Mangilia multilineata* Deshayes is the type. The genus *Hædropleura* is typified in *H. septangularis* Mtg., and *Donovania* by *D. minima* Mtg. A new species of *Mangilia*, *M. Campanoyi* B., D. and D., is described and figured. It has affinities with *M. albida* Desh., but is distinguished by its color-tion, more ventricose form and its much finer transverse sculpture.

The work is done throughout thoroughly and exhaustively, *Nassa costata*, for example, having twelve varieties beautifully figured, the form of each shell being shown to perfection. The five plates included in this part contain no less than 173 figures illustrating 36 species and their varieties.

The fourth fascicule, which will shortly appear, will treat upon *Natica*, *Lamellaria*, *Odostomia*, *Pyrgulina*, *Turbonilla*, *Eulimella* and *Eulima*.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting,

HELD MARCH 29TH, 1883.

The Chair was occupied by Mr. J. W. Taylor. Minutes of February meeting were read and approved.

PAPER READ.

Description of a New Variety of *Limax agrestis*, viz.:—*L. agrestis* var. *nigra*—by Mr. J. D. Butterell.

SPECIMENS EXHIBITED.

A number of curiously distorted specimens of *Limnæa peregra* from a pond near Castleford, by Mr. W. Nelson.

A series of the Land and Freshwater Shells of the neighbourhood of Chersley near Aylesbury, was shown on behalf of the Rev. H. H. Slater, M.A., F.Z.S., of Chersley Vicarage. They included about 22 species—mostly water shells from the River Thame, in the parish mentioned—and amongst them were *Paludina contecta*, *Limnæa auricularia* and *Helix concinna*. As there does not appear ever to have been published any lists or even scattered notices of the molluscan fauna of Buckinghamshire, Mr. Slater's note and specimens, fragmentary as both are, furnish a basis from which to commence investigations, and form an acceptable first instalment towards an authenticated county list.

A small collection of the shells of the Driffield district, including about 17 species and varieties of aquatic and 27 or more of terrestrial mollusca, was shown for Mr. L. B. Ross, F.C.S., of Driffield. On behalf of Mr. Ross were also shown various species of marine mollusca and slides of teeth and jaws.

Mr. J. W. Cundall sent for exhibition the following:—*Bulimus acutus*—Courtown, co. Wexford; Burnham Somersets.; Brampton and Woolacombe, N. Devon; St. Ives and Penzance, Cornwall. *Planorbis corneus*—Kenn Moor, Somerset. *Limnæa stagnalis*—Kenn Moor, Somerset; River Frome, Gloucestershire. *Carychium minimum*—Leigh Woods, Somerset.; Blaise Castle, Gloucestershire; Dudley Castle. *Helix rupestris*—Leigh Woods;

Durdham Downs; St. Vincent's Rock, Bristol. *Clausilia laminata*—Blaise Castle; St. Vincent's Rock; Coopers Hill; Leigh Woods; Brockley Coombe. *Bythinia tentaculata*—River Frome; Stroud Canal; Kenn Moor. *Helix nemoralis*—Blaise Castle; Durdham Downs; Ashley Downs; Coopers Hill; Leigh Woods; Brockley Coombe, &c. *H. hortensis*—Henbury; Stoke Clifford; Ashley Hill; Leigh Woods; Yatton Railsen; Portishead, &c. *H. ericetorum*—Ashley Hill; Burnham; Courtown, co. Wexford. *H. ericetorum* var. *minor*—Coombe Dingle, Gloucestershire. *H. lapicida*—St. Vincent's Rock; Coopers Hill; Leigh Woods. *Limnæa palustris*—Kenn Moor; Glastonbury; Frenchay, Gloucestershire. *Vitrina pellucida*—Brockley Coombe; Dudley Castle. *Vertigo pygmæa*—Ashley Hill; Durdham Downs. *Zonites nitidulus*—Coombe Dingle; Blaise Castle; Leigh Woods. *Valvata piscinalis*—Stroud Canal; Bath Canal; Kenn Moor. *Planorbis vortex*—Frenchay; Westbury-on-Trym; Kenn Moor. *Bulimus obscurus*—The Downs; Ashley Hill; Coopers Hill; Leigh Woods. *Pupa marginata*—Leigh Woods, Somersetshire; Sea Mills, Gloucestershire.

Mr. H. Richardson sent for exhibition a series of *Limnæa peregra* and varieties, from Went Vale.

Specimens were also shown by Mr. W. D. Roebuck and the Chairman.

Meeting,

HELD APRIL 26TH, 1883.

Mr. J. W. Taylor was voted to the chair.

PAPER READ.

Note on some malformed specimens of *Limnæa peregra*, by W. Nelson. This was a description of shells shown by Mr. Nelson at the previous meeting.

SPECIMENS EXHIBITED.

The Chairman, on behalf of Miss Fairbrass, showed *Limnæa palustris* var. *disjuncta* from Faversham; also on behalf of Mr. Boland, *Helix caperata* var. *major* from Galton; *Helix virgata* var. *alba* near Bristol; *Helix caperata* and vars. *ornata* and *minor* from Cleeve Hills, Worcestershire; and others.

Meeting,

HELD MAY 24TH, 1883.

Mr. J. W. Taylor presided. Minutes of previous meetings were confirmed.

PAPERS READ.

"Descriptions of New British varieties of Freshwater Shells," by W. Nelson; "Descriptions of some New Varieties of British Land and Freshwater Shells," by J. W. Taylor; "The British Slug List," by W. Denison Roebuck.*

SPECIMENS EXHIBITED.

On behalf of Mr. J. D. Butterell, a specimen of *Testacella haliotidea* var. *scutulum* was shown. Mr. Butterell intimated that this species appears not uncommonly in gardens at Beverley. The Chairman observed that specimens of this *Testacella* had occasionally been obtained by Mr. J. Emmett from the nurseries at Boston Spa; also that Mr. Shrubsole of Chester had written him stating that this species occurs freely in a lane near that town, and that a gardener there keeps them on purpose to kill worms in his Fernery. Several specimens were shown of *Helix hispida*, *H. nemoralis*, *H. rufescens* and its variety *rubens*, *Zonites cellarius* and *Z. nitidulus* from Pontefract Lane near Leeds; and *Limnæa peregra*, *L. truncatula*, *Pisidium cinereum* and *P. pusillum* from Middleton, on behalf of Mr. D. Barnfather. Mr. Taylor exhibited specimens of *Neritina fluviatilis* and its varieties, including var. *cerina* from the Avon canal, Freshford, near Bath. This is the first occasion on which this variety has been recorded as British. Mr. Taylor further showed a series of shells from Cantley and Doncaster; and *Limnæa peregra* var. *maritima* from Scarborough. A number of shells were shown for Mr. T. H. Easterfield, including *Limnæa auricularia* var. *acuta*, and *Anodonta cygnea* var. *Zellensis* from Cusworth. Mr. Ponsonby, London, sent *Unio tumidus* var. *Richensis* from Regent's Park; and *Limax maximus* and *Arion hortensis* from Northampton, were shown by Mr. W. D. Roebuck.

* Specimens of these varieties have from time to time been brought up for exhibition at the Society's Meetings.

Meeting,

HELD JUNE 28TH, 1883.

Mr. J. W. Taylor in the chair. Minutes of previous meeting were confirmed. Correspondence was read from the President, Dr. W. H. Evans, and Mr. J. W. Cundall. The following

DONATIONS

were announced :—

" Transactions of the Yorkshire Naturalists' Union," part v.; " Abstract of Proceedings of the Linnean Society, New South Wales " ; " The Scientific Roll," vol. i., part ii., No. 11.

NEW MEMBER.

Mr. Wm. Coates, Linthorpe, Middlesbrough, was nominated for membership.

PAPERS READ.

Description of a New Variety of *Limnæa peregra*, viz.—*Limnæa peregra* var. *stagnaliformis*.—by John W. Taylor.

SPECIMENS EXHIBITED.

Mr. Taylor brought specimens of *Helix fusca*, *H. rotundata*, *H. hispida*, *Zonites purus*, *Z. crystallinus*, *Z. cellarius*, *Z. nitidulus*, *Z. alliarius*, *Azeca tridens*, and *Zua lubrica* from Norwood Bottoms, near Bramham ; also *Clausilia laminata*, *C. rugosa*, and *Helix rotuudata* from Thorner. On behalf of Mr. R. M. Christy, were shown specimens of *Helix arbustorum*, and its varieties from various Yorkshire localities ; also *Limnæa auricularia*, York ; *Helix aspersa* var. *minor* from Chelmsford and Brighton ; and *Helix arbustorum* from St. Moritz, Switzerland.

Pupa secale var **edentula** Taylor.—The only locality known to present time for this variety is the original one at Ingleton, Yorks. Mr. Loydell of Ossery Road, London, however informs me that he has just obtained four examples from Eastbourne, Sussex.—J. W. TAYLOR.

THE DARTS OF BRITISH HELICIDÆ.

PART I., INTRODUCTORY.

By CHARLES ASHFORD.

Very little descriptive detail is to be found in English publications, whether devoted exclusively to our mollusca or to natural history in general, respecting the curious organ of the snail known as the Dart. The student must gather his information by one of two methods, either by dissection or by reference to the writings of foreign—more especially of German—naturalists. For the first, he may lack sufficient leisure, for the second, the requisite knowledge of the language. The present paper, therefore, will not, it is hoped, be superfluous. It will aim at embodying the principal matters of interest concerning the weapon and its sheath, and distinguishing the various forms in the several species.

The presence of the organ in question—by no means to be confounded with the "crystalline stylet" found in or near the stomach of certain acephalous molluscs—appears, so far as investigation has been carried, to be nearly confined to the genus *Helix*. The known exceptions (six or eight in number) occur in the border-land common to *Helix* and its allies, with one outlier, the American slug—*Tebennophorus Carolinensis*. It must not be supposed, however, that all species of *Helix* have a dart. Scarcely two-thirds of the British representatives of that genus are so furnished, and the extra-helicine dart-bearing species are, in this country, confined to the genus *Zonites*.

It will be convenient to offer first some general remarks, and afterwards to take up the species seriatim.

The Dart-sac. This is a short, ventricose pouch, generally club-shaped or oval, opening into the inferior portion of the vaginal tube, a little above the common vestibule (pl. i., figs. 1 and 2*). It takes a position in the anterior part of the

* Fig. 1 is from a fresh preparation, but the disposition of the various parts is imitated from Schmidt's "Stylommatophoren" to facilitate comparison.

mantle cavity when the animal is withdrawn into its shell, but is dragged forward along the right side of the neck when the snail is crawling. When two exist they generally occupy opposite sides of the vagina. The mucous glands with their simple or digitate cœca have their outlet near, but above, that of the dart-sac. The function of these glands still remains in doubt, but the fact that they seldom exist alone and are very rarely absent when the dart-sac is present, is suggestive, and the two organs should be studied together. The function of the sac is three-fold— to *secrete*, *preserve* and *protrude* the dart.

FORM. The occurring British forms, though varying much in proportion and contour, fall naturally into four groups, marked by the respective characteristics of (1) One simple sac; (2) A single bi-lobed sac; (3) Two simple teliferous sacs; (4) Two sacs, each bi-lobed (fig. 3). In addition, we have one or two species (e.g., *H. obvoluta*) with the organ in a rudimentary or degenerated state. Such forms do not develope darts. It is not to be expected, considering the small number of dart-bearing species in this country, that these four groups should be connected by fine gradations. Indeed, there are very few passage-forms. The case would be otherwise were the comparison extended to foreign species. Thus, Moquin-Tandon feels justified in stating, with regard to the 50 or 60 dart-bearing species he recognises as occurring in France: "On trouve toutes les nuances possibles entre les bourses simples et les bourses bilobées..." Without taking the phrase "all possible gradations" literally, there is ample evidence of a course of development from a simple to a more complex organ.—The shape of the dart-sac is remarkably persistent among the individuals of a species. The only variation I have noticed is afforded by *H. virgata*. In that species the extremity of the dart-sac is sometimes truncated or obtusely notched, and in that state may perhaps be considered a link between groups 1 and 2.

STRUCTURE. In the course of dissection there will be observed, first a thick muscular outer coat, consisting, according

to Semper, of transverse and longitudinal layers of muscle-fibre. This coat is semi-transparent, slightly translucent or quite opaque, and in colour pearly-white, grey, yellowish or light purple, sometimes spotted externally with small scattered or closely-set brown specks. The extremity is often thinner than the rest, whereby the eversion of the sac would appear to be rendered more easy. The aperture has usually two or more lip-like prominences (pl. ii. fig. 4). Within, and more or less intimately adherent to the outer, is another coat, thinner, less firm in texture, generally of the same colour as the first, but in the case of a few species densely charged with chocolate-black or violet-brown pigment cells, so much so as to give a livid aspect to the whole organ when viewed externally. This colouring, when it exists, is intensified at the neck of the sac, and extends to other connected organs (e.g., *H. nemoralis*). A lining membrane secretes a lubricating fluid of a viscid character. At the fundus of the inner cavity is a small sub-conical tubercle, first noticed by Martin Lister and supposed to play an important part in the formation of the dart. In *H. aspersa* this tubercle has a white nucleus, which, on desiccation, yields an amorphous mineral matter effervescing in hydrochloric acid. In *H. nemoralis* and some others it shares the pigment of the inner coat, of which in fact it is an offset. Whatever be the scope of the secretive function of this little protuberance, it certainly serves as a basis of attachment for the dart, whose point is thus directed towards the aperture (fig. 4). When the sac is dissected from its position of repose in the mantle cavity, it is frequently found—more especially in the case of single simple sacs—to be so acutely bent at the neck, that for the moment a wonder arises as to how the sharp-pointed weapon can possibly effect its exit, but it must be remembered that when the animal is extended, the sac, as has already been observed, is drawn forwards towards the right tentacle, in which position the flexure referred to becomes obliterated, and the axes of the sac and vestibule and the centre of the external aperture assume a nearly direct line. Then by

the inversion of the base of the whole organ towards its aperture, which admits of considerable lateral expansion, the dart is protruded outwards for use. Among our British reprentatives are a few species exhibiting a second pouch interposed between the teliferous sac and the vagina, to both of which it more or less adheres. This accessory appendage is never furnished with a weapon, and forms, with the dart-sac proper, the bi-lobed arrangement already referred to. It is best examined in *H. rufescens.*

GROWTH. The dart-sac does not make its appearance till the animal has entered upon free life and made some advance in growth. I can find no trace of it in the young *H. aspersa* of 5 or 6 mm. in diameter. When the shell of that species has attained 10 mm. the incipient organ presents itself as a small protuberance on the outer side of the vaginal tube. In one of 12 mm. I have found it still only 0.4 mm. in length and as broad as long, increasing to 1.25 mm. as the shell progresses to 16 mm. (the size of a threepenny piece). At this stage the inner coat is clearly differentiated, and when the shell has grown to 20 mm., the former is a soft roundish body about 0.66 mm. long, with slight parietal attachment, but with a perceptible tubercle at its base. As the outer envelope increases in size and consistency, the inner coat assumes the shape of a sugar-loaf, then becomes pointed at the apex and grows more rapidly than the outer till the two are of nearly equal length. By this time the *shell*, judged by its completed peristome, will have reached maturity. As the pairing time approaches a rapid change takes place. The whole organ acquires a much firmer muscular condition, and the colouring matter—in such species as possess it—is developed, first as a light pink round the neck of the sac, then as a reddish or bluish-brown more generally diffused, ending in the full-tone. It appears to me to be during the later stage of coloration, or the corresponding period of growth where coloration does not occur, that the dart is formed. The first intimation of the presence of the two dart-sacs of *H. rufescens* is

afforded by the appearance of a swelling on each side of the intervening passage, when the shell is not quite half grown. As these increase into hemispherical knobs a septum is distinguishable through the transparent masses, and later the free end of each becomes notched. These indentations gradually increase in depth, apparently by the outward growth of the two lobes, till each teliferous sac is fully formed and furnished. Such at least are the appearances presenting themselves in the examination of a series of individuals of different ages, for after opacity of the shell has set in, it is manifestly impossible to trace progressive growth of an internal organ in the same individual.

The Dart. Dard, Pfeil, Love-dart, Flèche d'amour, Liebespfeil, Spiculum amoris, Hasta amatoria, Telum Veneris... of authors.

STRUCTURE. Around the tubercle, already referred to as rising from the inner base of the sac, is formed a small conico-cylindrical annulus, about as broad as long, composed of numerous (12 to 20) calcareous rods held together by animal matter (fig. 5). These rods are arranged longitudinally like the cane or whalebone in a cricketer's "leg-guard," and their projecting extremities form two denticulated circular margins, the one resting upon the circumference of the inferior part of the tubercle, the other encircling but not concealing its apex. The sides of the tubercle are furrowed with corresponding sulci, in which the rods rest with some slight adhesion, and where they are in all probability secreted. According to Pérez, attention was first called to this annulus by A. Schmidt in 1849, but I find it well described and figured by Verloren in his "Preisschrift," published twelve years earlier. Schmidt called it the "crown" (Krone), a term well descriptive of its pretty coronet-like appearance, but hardly suitable to our language, inasmuch as we always apply the term "head" to that part of a spear or arrow that carries the blades or barb. For the same reason the part of the dart attached to the annulus and called by German writers the "head," I shall have to call the "base."

In some species the annulus is permanently absent. The dart consists of a straight or curved, sometimes slightly twisted, tubular shaft of carbonate of lime, tapering to a fine, solid, transparent point above (fig. 8), and enlarging gradually, or more often somewhat abruptly to the base (fig. 7), where it assumes the form of a sub-conical cup whose roughly indented margin rests upon and fits the superior margin of the annulus (fig. 6). The apex of the tubercle thus projects into the expanded base of the dart, attachment between the two being further secured by an intervening viscid secretion, which also extends in the form of a glutinous thread some little way up the central perforation of the shaft. The sides of the shaft are sometimes furnished with blades symmetrically and longitudinally disposed; they serve to brace the stem and are not intended for cutting. A quarter-inch objective clearly reveals, under favourable light, the crystalline character of the edges of incomplete blades, but is insufficient for detail. The reader who requires a strictly technical description of the dart and its sheath is referred to Prof. C. Sempers's "Beiträge zur Anatomie und Physiologie der Pulmonaten," Leipzig, 1856.

FORM. Between the almost linear dart of *H. caperata*, devoid alike of blades and conical base, and the complicated weapon of *H. Pisana* with its four channel-edged blades, is a series of passage-forms, constant in each species, but connected in a way that points definitely to a course of progressive development. The first step is indicated by a slight compression of the region near the point (*H. ericetorum*), the next by a further expansion into a lanceolate head with blunt edges (*H. arbustorum*). A thinner head with sharp edges (*H. lapicida*) conducts to a form with two slender blades springing from a circular shaft (*H. virgata*). The next stage is reached by an enlargement of the pair of blades both as to prominence and length, and the addition of another but less prominent pair, disposed in a plane at right angles to that of the primary couple (*H. nemoralis*). We next find the four blades equally

salient and their edges still sharp (*H. aspersa*), then the margins of the blades appear tumid and rounded off (*H. pomatia*), and finally the thickened edges are cleft, and, opening out, form a double-flanged, angular channel (*H. hortensis*, fig. 9). In the absence of genealogical affinity it would be difficult, as it seems to me, to account for this connected sequence, especially when we know that foreign forms supply connecting links. Among the British species there occurs no instance of a three-bladed dart.

One cannot view the exquisitely finished weapon without admiration. We see in its tubular shaft—as also in a stem of grass—the required strength ensured with suitable economy of material, for it is well known that a hollow cylinder is stronger than a solid one, when the areas of the material in the transverse sections are equal. We see, too, a vast accession of strength accruing from the disposition of the blades: an arrangement now adopted in the flanged iron girders of our buildings, though old as the Iris leaf. Even the curvature of the shaft gives additional firmness in one direction. These provisions, seconded by the tough thick-walled sheath, ensure the brittle structure from injury till it is required for use.

GROWTH. As has already been stated, the dart appears to be formed very rapidly. Keferstein and Ehlers assign, as a ground for this supposition, the fact that immature darts are seldom met with. Semper says that, notwithstanding his numerous dissections, he was never so fortunate as to meet with a weapon in course of formation. Again, I never met with a dart, mature or immature, associated with a manifestly incomplete shell. Now when we consider that in our climate, and that of central Europe, the shell generally reaches perfection early in the spring, and that coupling also commences early in the year, it will be seen that little interval is left for the formation of the weapon. Pérez is decisive and asserts that all is done in about six days. His reasons, deduced from observation, will be found in his pamphlet—"Sur la Generation des Moll.

Gaster." Further observations are necessary but they are difficult to make. In the course of above 500 dissections I have met with about 20 decidedly immature darts. These have all been wanting in annulus, expansion of the base, and (more or less) in blades. From an examination of these few cases, thus much seems to me evident: that the dart is not built up like a factory chimney by successive accretions above: that the shaft first appears as an excessively short and slender needle, attached to the very apex of the tubercle: that it increases simultaneously in length and breadth: that the blades are next formed from the shaft outwards, by the addition of crystals along their edges (evident from the jagged edge seen in a partially completed blade): that the upper part of the blades, that namely nearest the point, is completed before the lower portion: and, finally, that the conical base and the annulus, by whatever part secreted, are of later growth. I should add however, that I have met with immature darts of only a few species. It is an interesting fact, that in the earlier stages of growth it is difficult, if not impossible, to determine the species from inspection of the isolated dart, at least in those cases in which the shaft is quite or nearly straight. To the question: "Where resides the secretive power?" no conclusive answer has been given. Moquin-Tandon, if I understand him rightly, locates the function in the tubercle alone. Several writers have adopted Cuvier's suggestion, that the walls of the sac are concerned in the formation of the blades. Leydig considers that the annulus is formed by the tubercle, and the blades by the interior coating of the sac. All these leave the shaft unaccounted for.

USE. After much speculation upon this subject fifty or more years ago, when Imagination frequently acted as Reason's substitute, naturalists have settled down in the opinion that the dart is simply an organ to induce by its puncture excitement preparatory to pairing. Prof. Semper, whose opinion is always worthy of deep consideration, combats this view in the work already quoted, and grounds his objection on the slenderness

and extreme brittleness of the point of the weapon, which, he says, would give way at the slightest contact with the opponent's tough skin. But is not slightest contact all that is necessary to attain the end required? Besides, many, from Lister to the present day, have observed the isolated weapon left hanging by its point from the partially pierced skin. The unusual activity displayed by a pair of *Helices*, each striving, in a blind fashion, to prick its friendly adversary with the little stiletto, is described as something amazing. One writer terms the exercise "extraordinary gymnastics." It is a veritable but harmless fencing bout with eyes half-blindfolded, and rapier fastened to the shoulder! No wonder the belligerents occasionally make a random thrust, and pierce when they only mean to prick. In consequence of the slight attachment of dart to tubercle and annulus, the connection is often severed in the conflict. Sometimes the annulus comes away with the dart, sometimes it is left in the sac free or *in situ*. A weapon separated in the strife either falls to the ground, or remains hanging from the skin of the wounded party, or becomes entangled in the body-slime of its owner or his partner. In the last case a curious fate may then befall it. During the pairing which follows its use the dart may by accident come in contact with and adhere to the exterior of the organs engaged, and ultimately be withdrawn with them into the body of one of the couple. There it works its way, base uppermost (for in any other position it would be stopped at the entrance), either up the spermatheca duct, into the branch of that duct, into the oviduct, or into the spermatheca itself. To understand this process, it is only necessary to call to mind the child's amusement of putting an ear of barley, *inverted*, into the coat-sleeve to find it at night at the shoulder or down the back. It may progress—it cannot retreat. It thus sometimes happens that two, or (more rarely) even three darts are met with in the tubular organs of one animal. But this is not all. It is not an uncommon circumstance (it has occurred five times in my own experience) to find a dart lying *free*

in the intervisceral spaces of the mantle cavity—for instance between the branches of the mucous glands or adhering to the exterior of the oviduct or to the albumen gland. Schmidt even found one embedded in the liver. Now there is no communicating passage between the interior and exterior of the tubular organs (see fig. 1). How then can a dart make its way into such positions. Many authors, looking upon the blades as cutting edges instead of simple strengthening stays, appear to have taken it for granted that in such cases the whole weapon has been actually thrust through the outer integument during conflict. Surely this is mechanically impossible. The dart is too brittle, as Semper remarks, the force exerted is inadequate, and the very form of the dart presents an obstacle to entrance. It rarely penetrates more than one or two millimètres. I would rather suggest that the dart has been first introduced into one of the tubular organs as already described, that it has then lodged in some bend which it could not traverse, and finally, by the constant movements of the animal, has worked its way, point foremost, through the soft, thin wall of the tube. By such means only could it penetrate the liver. Analogous things happen in man. There are scores of cases on medical record of needles, etc., accidently swallowed entire or in fragments, making their way through the coats of the alimentary canal and becoming ultimately lodged even in the joints of the limbs. According to Pérez the entombed dart is gradually absorbed.

It is commonly stated that the *Helices* are provided with darts during the pairing season. This is true but not the whole truth. No doubt more individuals are furnished with them at that period, because it is the time when a great number reach maturity, but darts may be found *in situ* any month in the year. There is good evidence that a new weapon is formed after the loss of the old one. Individuals possessed of a pair sometimes lose one and retain the other, and some species appear less liable than others to part with their weapon.

SYSTEMATIC VALUE. That an organ confined principally to a single genus can have little weight in the arrangement of higher groups is self-evident. On the other hand, it can scarcely be denied that the type of dart, in virtue of its remarkable constancy in the individuals of a species, is a valuable criterion in the discrimination of closely allied forms, and in very critical cases may be allowed, so to say, a casting-vote. What relative weight should be assigned to dart, shell, jaw, lingual-ribbon, etc., in the subdivision of the unwieldy genus *Helix* into large groups, must be left to the judicious systematist.

MISCELLANEOUS REMARKS. Schmidt considers he has detected a relation between the form of the dart and the colour, number and disposition of the bands of the shell. Mörch, summarising that author's observations, says that species furnished with a pyramidal subulate dart, associated with mucous glands having more than eight cœca, have (normally) never more than five bands; that those with a dart of the type of that of *H. arbustorum*, and two simple or bifid mucous glands, have never more than four bands; and that two subulate curved darts are associated with shells having numerous linear markings. It is highly probable that some such relation exists among forms belonging to the same stemma, but until something is ascertained of the anatomy of thousands of tropical forms, as yet only known by their shells, it is premature to lay much stress upon such rules. Advantage will however arise from calling attention to the subject. Paasch is of opinion that the dart occurs only among those species whose egg-envelopes are lined with calcareous crystals. Schmidt has found in the reproductive organs of *Bulimus acutus*, and one or two of its allies, an unguiform, calcareous plate, which Mörch thinks may perhaps be the analogue of the *Helicine* weapon.

The dart may in a few cases be satisfactorily extracted for preservation by careful dissection, but it is generally safer and often indispensable to boil the sac in a solution of caustic potash. Goldfuss recommends this process in all instances.

NOTE ON SOME MALFORMED SPECIMENS OF *LIMNÆA PEREGRA*.

By WM. NELSON.

Whilst searching for shells in a pond at Allerton Ings, near Castleford, on the 26th of March, I found a number of *Limnæa peregra*, a good proportion of which were curiously malformed. The general form of the shells partook of the short spire, and expanded aperture of the variety *ovata*; in many cases the shell had a well developed, reflected lip, after the manner of the variety *labiosa*, but with no trace of the thickened rib of that variety; at this stage of their growth, they would have been taken for complete adult shells; but from some cause or other (no doubt an abundance of food) the animals had found it necessary to enlarge their shells; this they had done by adding from one quarter to one half a whorl, leaving the reflected lip forming an acute ridge across the shell in the line of growth. In several specimens the additional growth had been carried out very unsymmetrically, the columella being very much twisted and prolonged, causing the lower part of the aperture to be excessively produced, this form of aperture evidently being unsuitable for the animal, it had rounded off the irritating corner, by forming a septum, and in one or two cases the aperture being too large, an additional septum had been formed, causing the shell to have an aperture of three different forms, at different periods of its growth.

Vitrina pellucida var. **depressiuscula** Jeff. — The published habitats of this variety do not appear to have been added to since the issue of Dr. Jeffreys' classical work, as Rimmer gives only the localities previously cited by him, viz., near Swansea and Plymouth.

The woods on Cooper's Hill, near Cheltenham, may however be added to the already known localities, as I found this variety there in April, 1866, whilst searching for *Clausilia Rolphii*.—J. W. TAYLOR.

On Zonites glaber Studer **as a member of the British Fauna.**—Some misconception would appear to exist regarding the discovery of *Zonites glaber* in this country. The honour of adding this species to our list is usually given to Mr. Thomas Rogers of Manchester, a most industrious and ardent conchologist. Dr. Jeffreys, to whom the specimens had been sent for identification, did not appear to suspect any previous records, as in 'The Annals and Magazine of Natural History,' for May, 1870, he thus chronicles the occurrence:—"My correspondent, Mr. Thos. Rogers of Manchester, has added another species to this well-worked department of our fauna. Specimens of a *Zonites* he has sent me, collected by him under stones at Marple Wood, in Cheshire, prove to be the *Helix glabra* of Studer."

Rimmer's lately published work, 'The Land and Freshwater Shells of the British Isles,' throws no fresh light on the subject, our knowledge of it as an inhabitant of this country being assumed to commence with its finding by Mr. Rogers.

Dr. J. E. Gray, as long ago as 1840, was well aware of the occurrence of this species in the British Isles, but he regarded it as a large variety of its near ally *Zonites alliarius* (a view to which some conchologists still incline), and recorded it in his edition of "Turton's Manual of the Land and Freshwater Mollusca of the British Islands, as var. 2, placing *Helix glabra* Studer in the synonymy. It is hardly likely that so acute a conchologist would be mistaken in its identification, more especially as it has so wide a distribution in this country, and therefore specimens would be not unfrequently met with. I venture to think that Dr. Gray's adoption of the term *Zonites alliarius* var. *glaber* Studer, instead of var. 2, would have rendered the oversight less probable. The whole circumstance seems to point to the desirability of applying definite names to the most prominent variations of our different species, in the manner so admirably carried out by Dr. Jeffreys in his classical work, "British Conchology."—J. W. TAYLOR, June 21st, 1883.

Slime Spinning by Arion hortensis.—On the 27th of May, Mr. A. E. Ebdell of Ripon sent me a beautifully marked specimen of the var. *rufescens* of this species, found near that place. I was much interested in observing the animal, which was about an inch long, spin a thread of slime. Being placed on a flat paper-knife it walked straight off it, seemingly into the air, and even while the end of its tail was the only part in contact with the paper-knife it maintained its horizontal position, swinging to the perpendicular one on finally quitting it and becoming suspended. It then spun a thread of about four inches, and when contact was broken on its reaching a support, the thread immediately shrunk into a minute, scarcely visible point of slime.—WM. DENISON ROEBUCK, Leeds, June, 1883.

Limnæa peregra var. **stagnaliformis** n. v. (pl. i., fig. 2, 3). Shell somewhat fusiform in shape, the last whorl large, making about 4-5ths of the total length. Length, 35 mill., breadth, 18 mill. Length of aperture, 25 mill., width, 13 mill.

This striking variety I noticed a short time ago in the fine collection formed by the Rev. W. C. Hey, of York. Its resemblance at the upper aspect to the short spired variety of *L. stagnalis* is very striking, and suggested to me the application of its appropriate name. It was found by Mr. Hey in the village pond at Buckton, near Flamborough. All the *peregra* found associated with it were of the same form, but of a smaller size.

Mr. Hey, in forwarding the drawings obligingly made by him at my request, remarks—"Its size is very remarkable, as the large specimens of *L. peregra* generally belong to the ampullaceous form, connecting this species with *L. auricularia*, but the example before us rather approaches *L. stagnalis* in the length of the spire and comparative narrowness of the aperture.—J. W. TAYLOR, June 25th, 1883.

Helix lapicida var. **nigrescens** n. v. Shell uniformly very dark brownish-black, except the apex, which is paler, and the peristome, which is white.

In this distinct variety I have to record another discovery by my esteemed correspondent, Miss F. M. Hele, who has been fortunate in collecting specimens at Westbury, near Bristol, where however it is very rare. She has kindly presented me with specimens.—J. W. TAYLOR, June 15th, 1883.

Iconographie der Schalentragenden Europaischen Meeresconchylien von Dr. W. Kobelt.

Dr. Kobelt, of Schwanheim, well known amongst Conchologists as the author of the continuation of Rossmassler's 'Iconographie of the European Land and Freswater Shells,' has in hand a similar work on the Marine Shells of the European Seas. This favourite field of study will receive additional attraction and new impulse from the issue of this publication, as it will doubtless receive the same able and conscientious treatment bestowed upon the Land and Freshwater Shells. The work will be published with plain plates at 4 marks, or coloured plates at 6 marks per part, by Theodor Fischer, of Cassel.—J.W.T.

Helix arbustorum var. **pallida** TAYLOR.—This name I find has been pre-occupied by Dr. C. A. Westerlund for another variety of this species characterized by the presence of white lines—"lineis candidis." This variety has not yet been found in this country. I propose the name **cincta** to supersede *pallida* for the form described by me in the 'Journal of Conchology,' vol. iii. p. 250, 1881.—J. W. TAYLOR, June 18th, 1883.

Bulimus obscurus var. **albinos** Moq.—This variety is found according to Rimmer in the counties of Kent—at Sevenoaks; Dorset—at Lulworth; Gloucestershire—at Bristol; and Surrey—at Croydon.

To these localities may be added Cooper's Hill, near Cheltenham, where it has been found by Mr. Nelson; Chislehurst, Kent, by Mr. S. C. Cockerell, who has favoured me with a specimen; near Chelmsford, Essex, by Mr. R. M. Christy; Winchester, Hants, by Mr. B. Tomlin; Knaresborough, and near Whitby, Yorkshire, by Mr. Beevers and Mr. Pollard respectively; Mr. Pickering has also found it near London.—J. W. TAYLOR, June 19th, 1883.

Physa fontinalis var. **albina** Jeffr.—The only recorded locality for this form in our text books is Birkenhead, given on the authority of Webster.

Mr. Ashford informs me he has specimens collected at Scarborough by the late Mr. Bean; Mr. T. D. A. Cockerell has found a single specimen at Herne Bay, Kent; and I have a very characteristic specimen kindly given me by Mr. J. Pickering, of London, and collected by him in the neighbourhood of the metropolis.—J. W. TAYLOR, June 19th, 1883.

Limnæa palustris var. **globosa** n. v. (pl. i., fig. 3, 4). Shell globosely oval, with a very short spire, and five very swollen and tumid whorls. Length 10½ mill., breadth 7½ mill. Aperture—length 7½ mill., breadth 3½ mill.

This interesting variety has been found by Mr. S. C. Cockerell, at Enfield, in company with the typical form. The shell seems quite regular in its growth and bears a startling resemblance to the tumid form of *L. peregra*; but after a careful examination I am of opinion it is correctly referred to *L. palustris*. It is finely striated in the line of growth, and faintly malleated on the last whorl, caused by the somewhat blunt spiral ridges, between which there are faint revolving striæ. The whorls are very convex and shouldered, and the columella is decidedly that of *L. palustris*.—J. W. TAYLOR, June 25th, 1883.

BIBLIOGRAPHY.

On the occurrence of Vertigo Moulinsiana *Dup.* in Herts.—By H. Groves, Trans. Herts. Nat. Hist. Soc., vol. i., part 2, 1880 with plate.

Mr. Groves, in this paper gives an account of the British distribution of the true *V. Moulinsiana*, Dup., as far as he himself has observed it. The localities he enumerates are near Otterbourne, Hants.; Hitchin, Herts.; and on the Essex border of Herts., near Rye House.

The habitat of this species is the swampy margins of rivers and ditches and very wet marshes, with such plants as *Carex paniculata*, *C. paludosa*, *C. riparia*, *Juncus*, *Iris*, *Typha*, *Phragmites*, &c., up the growing leaves and stems of which it occurs in the greatest numbers, while *V. antivertigo*, its companion seems to prefer the decaying leaves which have fallen into the water, and is found just above the surface of it.

Mr. Groves calls attention to the dwarfing of specimens occurring in small isolated localities and points out the probable causes.—J.W.T.

Mediterranean Mollusca (No. 3) **and other Invertebrata.**—By J. Gwyn Jeffreys, LL.D., F.R.S., &c., from Ann. and Mag. Nat. Hist., June, 1883, p. 393—401 with plate.

This paper is another contribution by the eminent conchologist Dr. Jeffreys to our knowledge of the Mediterranean mollusca. Admiral Spratt having placed at Dr. Jeffreys disposal some material dredged about 30 years ago off Crete, in from 70—120 fms., Mr. and Mrs. Robertson kindly sorted the material for Dr. Jeffreys, and supplied the lists of *Ostracoda* and *Foraminifera* which are appended to this report. The total number of species enumerated is about 150, of which one is a Brachiopod, 38 Conchifera, 4 Solenoconchia, 6 Pteropoda, while the remainder belong to the Gastropoda. Nine new species are described and figured. *Cyclostrema minutum* (pl. xvi., fig. 1); *Rissoa concinnata* (fig. 2); *Aclis attenuata* (fig. 3); *Odostomia*

brevicula (fig. 4); *Eulima acutalis* (fig. 5); *E. perminima* (fig. 6); *Brugnonia pulchella* (fig. 7)—a new genus *Brugnonia* is established for this species which belongs to the family *Solariidæ*. *Adeorbis exquisitus* (fig. 8); and *Cylichna parvula* (fig. 9).—J.W.T.

On the Freshwater Shells of Australia.—By Edgar A. Smith, F.Z.S., Journ. Lin. Soc., vol. xvi., 1881.

About 150 species are now known to inhabit Australia, but with a few exceptions no strange or novel types are found. The existence of the African genus *Physopsis*, an *Unio* with tuberculose surface and black epidermis and a shell described as belonging to the South American group *Mycetopus* are the most remarkable. The genus *Physa* would appear to be the predominant group no less than 52 distinct forms being known. *Unio* is next in point of numbers having 17 species, *Melania* 12, *Neritina* 10, *Limnæa* 11, *Paludina* and *Corbicula* each with 9, *Hydrobia?* 6, *Planorbis* 6, *Sphærium* and *Bythinia* 4, *Pisidium* 3, *Segmentina* 2, and *Balea*, *Amnicola?*, *Paludinella?*, *Larina*, *Gabbia*, *Ancylus*, *Physopsis*, *Mycetopus*, and *Navicella* each with one representative only.

Melania tuberculata Müll. is given for the first time from Australia, and three new species are described *M. Queenslandica* (pl. v. fig. 11) from Queensland, *M. Elseyi* (fig. 12) and *M. subsimilis* (fig. 13).

All the Australian *Vivipara* have two constant peculiarities, in possessing spiral sculpture and in the absence of color-bands below the periphery. A form from N. Australia allied to *essingtonensis* is described as new under the name of *tricincta* (pl. vii. fig. 16). A new species from Victoria River, N. Australia is described as *dimidiata* (fig. 17). A new species of *Bythinia* from the last locality is named *australis*, it is closely allied to *B. affinis* Brazier from Queensland. A new species of *Hydrobia—Brazieri* (fig. 21) from Clarence River, N.S.W.; *H. Petterdi* (fig. 23) from Richmond River, N.S.W., and Alert River, Queensland; and *H. Angasi* (fig. 22) from Compasely River, Victoria. Two

new *Limnææ* are described, *L. Brazieri* (pl. v. fig. 15) Glebe Point, Sydney, N.S.W.; and *L. Victoriæ* (pl. v. fig. 16) from Barnsdale, South Australia. Nine new *Physæ* are described, viz., *P. gracilenta* (pl. vi. fig. 20); *P. producta* (fig. 21); *P. Brazieri* (fig. 22); *P. Queenslandica* (fig. 23); *P. Quoyi* (fig. 24); *P. Etheridgii* (fig. 25); *P. breviculmen* (fig. 26); *P. tenuilirata* (fig. 27); *P. exarata* (fig. 28). Two new *Planorbes* are also described, viz:—*essingtonensis* (fig. 33-35), and *Macquariensis* (pl. vii. fig. 4-6).

Planorbis spirorbis Müll. is also included in the list on the strength of two series labelled N. Australia in Cumingian Museum. Two new *Segmentinæ* are also added to the list—*Australiensis* and *Victoriæ*. The latter species has no lamellæ, and we think it is hardly correctly placed in this genus, being deficient of its essential character. Two new *Corbiculæ* are described, *Deshayesii* (pl. vii. fig. 28-29), and *sublævigata* (fig. 30-31). The new *Sphæria* are *Queenslandicum* (fig. 33), and *Macgillivrayi* (fig. 34), and a new *Pisidium* not unlike *casertanum* is described as *Etheridgii* (fig. 35).

The whole work is ably and thoroughly done, and is a most desirable contribution to our knowledge of the freshwater shells of that vast continent, and it forms a most welcome basis for further investigation —J.W.T.

Land and Freshwater Mollusca in the Arctic Regions of Norway.—By Miss Bergith Esmark.

Thirty-five species are enumerated, but several are considered by British Conchologists as varieties only. A new variety of *L. truncatula* is described and figured—v. *Schneideri*—which was found very numerously on Floifjeld.

Helix harpa has been found at Kirkenaes in South Varanger and *H. fruticum* at Lofoten. *H. arbustorum* and its varieties *alpestris* and *morbosa-albina* also, are found in the Region under consideration. An addition to Norwegian species is *Pupa arctica*, Wallenberg, found by Mr. Schneider on Horno at Vardo.

Limax agrestis is very common on Tromsoen, but few of the specimens exceed 25 mill. in length, and they are of a uniform light brown color. The distribution is given as 17 species in Nordland, 27 West Finmarken, and 14 in East Finmarken.—J.W.T.

The Invertebrate Fauna of the Firth of Forth part iii. comprising the *Porifera*, *Coelenterata* (pars) *Vermes*, *Pycnogonida*, and *Mollusca*.—By George Leslie, Demonstrator of Zoology, University of Edinburgh, and W. A. Herdman, D.Sc., F.L.S.

This list is founded on Dr. McBain's extensive catalogue, to which is added the additional species found by the German Expedition in 1872, and reported upon by Metzger and Meyer. Mr. Balfour and Rev. J. McMurtrie have also added some species, and in addition the latter gentleman has revised the M.S., and incorporated much valuable information gained in his extensive knowledge of the Conchology of the Firth of Forth.

About 200 species are enumerated, of which 83 are *Conchifera*, 1 *Solenoconchia*, 84 *Gastropoda*, 23 *Nudibranchs*, 2 *Pulmonobranchs*, and 8 *Cephalopods*. In addition to the species, many varieties are mentioned as occurring in the district.

In point of numbers the fauna of the Forth does not compare favorably with that of the Clyde. Mr. A. Brown in his 'Mollusca of the Firth of Clyde' admits 290 species of which 2 are Brachiopods no representative of which group is found in the Forth, 138 are Gastropods against 84, and 3 Cephalopods against 8 found in the Forth.

The whole list is carefully done, and the localities and the identifications are given with care and exactitude. The work is a welcome and solid contribution to our knowledge of the fauna of Scotland.—J.W.T.

On the Mollusca of H.M.S. 'Challenger' Expedition. The *Cæcidæ*, comprising the genera *Parastrophia*, *Watsonia*, and *Cæcum*.—By the Marquis de Folin, with a prefatory note by the Rev. Robert Boog Watson, B.A., F.R.S.E., F.L.S., &c., Proc. Lin. Soc., Dec. 16th, 1879.

The Marquis de Folin, who has made a special study of *Cæcidæ*, of which he has a vast collection from all parts of the globe, was entrusted by Mr. Watson with the report upon the specimens gathered during the Expedition.

A new genus *Watsonia* is established for a shell found near Cape York. *W. elegans*, Folin, whose generic feature is having only a single decollation, leaving the shell acutely conical. Other new species are *Parastrophia Challengeri*, Folin, Cape York; *Strebloceras subannulatum*, Folin, Honolulu; *Cæcum lineicinctum*, Folin, off St. Thomas, West Indies; *C. attenuatum*, Folin, Cape York; *C. subflavum*, Cape York; *C. succineum*, Folin, Cape York; *C. microcyclos*, Folin, Cape York; *C. exile*, Folin, Tongatabu; and *C. crystallinum*, Folin, from Honolulu. —J.W.T.

LIFE HISTORIES OF BRITISH *HELICES.*

HELIX (POMATIA) ASPERSA MÜLL.

By JOHN W. TAYLOR.

In treating of this species I have again been largely indebted to the kind friends who so obligingly assisted me with the former paper.

The very numerous cases where I have received the assistance of Mr. C. Ashford, Mr. Butterell, Mr. J. Emmett, Mr. L. E. Emmett, Mrs. Fitzgerald, Miss F. M. Hele, Rev. W. C. Hey, Rev. J. McMurtrie, Mr. Nelson, Mr. Roebuck, Dr. Buchanan White and numbers of other friends, cannot always be expressly indicated, but I am desirous of acknowledging here how greatly I have benefited by the knowledge so freely placed at my disposal. Mr. C. Ashford has, in addition to large stores of miscellaneous information, again placed his knowledge of darts and dart sacs at my service, and Mr. Butterell has again kindly furnished me with slides of the jaw and lingual ribbon.

It is still my aim to show the deficiency of our knowledge, in the hope that observers will supplement the information as far as they are able.

Synonymy.

1774 *Helix aspersa* Müll. Verm. Hist., ii., p. 59.

1777 *Helix hortensis* Pennant. Brit. Zool., p. 136, pl. lxxxiv., fig. 129; non Müller.

1778 *Cochlea vulgaris* DaCosta. Test. Brit., p. 72, pl. iv., f. 1.

1789 *Helix lucorum* Razoum. Hist. Nat. Jor., i., p. 274; non L.

1789 *Helix variegata* Gmel. Syst. Nat., p. 3650.

1789 *Helix grisea* Gmel. Syst. Nat., p. 3650; teste Westerlund.

1799 *Helix lucorum* Pult. Cat. Dorset; teste Pfr.

1800 *Helix hortensis* Donovan. Nat. Hist. Brit. Shells, t. 131; non Müller.

1817 *Helix grisea* Dillwyn. P. 943; teste Gray's Turton, p. 128.

1819 *Helix hortensis* Turton. Conch. Dic., p. 60; non Müller.

1832 *Helix (Helicogena) aspersa* Fér. Hist. Moll. Terr. et Fluv.

1837 *Pomatia aspersa* Beck. Ind. Moll., p. 44.

1837 *Cœnatoria aspersa* Held. Isis, p. 911.

1840 *Helix (Acavus) aspersa* Gray. Turton's Man. Brit. Shells, p. 128, pl. iv., f. 35.

1841 *Helix secunda* Costa. Villa Cat; teste Pfr.

1855 *Helix (Cryptomphalus) aspersa* Moq-Tand. Hist Moll., vol. ii., p. 174, pl. xiii., f. 14—32.

1861 *Helix spumosa* Lowe. Ann. and Mag. N. H., 3rd sec. vii., p. 111; teste Pfeiffer.

1876 *Helix (Helicogena) aspersa* Westerl. Faun. Eur. Moll., extramar, p. 133.

Helix fluminensis Lang. teste Pfr.

"Some authors seem to have considered this as the *Helix lucorum* of Linnæus, but it certainly admits of much doubt. Gmelin did not think so, for he has given all the synonyms of this shell to his *H. aspersa*, and has made his *H. lucorum* a very different shell, a figure of which is given in Lister's Conchology, tab 1058, fig. i.

Doctor Turton has confounded the synonyms of the *aspersa* with those of the *hortensis*, not considering the former as an English shell, and therefore has quoted this shell of Lister, Pennant and Da Costa for the *hortensis*." Mont. p. 410.

Helix secunda Costa, *H. Fluminensis* Lang, and *H. spumosa* Lowe, are given on the authority of Dr. Pfeiffer.

Rimmer queries whether *aspersa* was not a slip of Müller's pen for *aspera*.

Classification.

This species is now generally placed in the subgenus *Pomatia* of Leach, a group of which the characteristics are:—

Shell imperforate or subimperforate, globose, striate, calcareous-horny, generally banded, whorls 4—6, convex, the last large, ventricose, descending, aperture lunate-orbicular, peristome patulous or straight, labiate within, the columella margin reflected, generally callous.

Dr. Westerlund places it nnder *Helicogena*, following Férussac, but the characters of the group are precisely those of *Pomatia* Leach. Dr. Gray places it in *Acavus*, of which *Helix hæmostoma* L., a native of Ceylon, is the type. Moquin-Tandon places it in *Cryptomphalus* Agassiz, regarded by Prof. von Martens as a section of *Pomatia*, differing in the less solid shell, and flat and more membranous epiphragm.

Development.

The eggs are laid from May to October in 5 to 8 days after pairing, and hatch in from 15—30 days. They are from 4—4½ mill. in diameter, of somewat oval form, and are brilliant white or greenish-white in colour, with an opaque, shining, membranous and very elastic envelope, so that they rebound on falling on a solid object. On exposure they dry in, to an an irregular shape, and if dropped into water in this state they fall to the bottom. Their weight is about 35 millegrammes. They vary in number according to Moquin-Tandon from 50—80, and to Bouchard-Chantereux from 100—110, but when individuals couple young the number of eggs laid by them is less. M. Gassies says they are placed in holes containing about 50 eggs

each and are agglutinated together by a colorless and sticky mucus. In this species the mass of eggs deposited nearly always exceeds in bulk that of the animal and shell inclusive. The young attain maturity at the beginning or middle of second year.

The eggs cannot be well preserved in spirit, like those of *H. pomatia*; being much softer they collapse as soon as immersed.

M. Turpin, as quoted by Moquin-Tandon, says: "The thicknes and firmness of the exterior envelope depends upon a great number of particles of carbonate of lime, which are spread over the internal surface and crystallize in little rhombohedrons, resembling Iceland spar; some are isolated, some in groups of 2, 3, 4, 5, or 6. The largest are rather more than 0·01 mill., and their angles are 105° and 75°. The inner membrane is exceedingly thin, and quite hyaline."

Mr. A. Nicholson (Sc. Goss. 1872, p. 238) writing of the structure of the egg envelope, says: "I succeeded in separating seven layers. The inner one is always as transparent as glass, every one of the others is strewed, more or less closely, with beautiful crystals of carbonate of lime, and it is when thus divided the crystals show to most advantage, and although all are cubical in structnre they present a variety of forms according to the angle presented to the eye by the individual crystal. ...I estimate them at about 150,000 in each egg."

Mr. Ashford remarks that carbonate of lime does not crystallize in cubes, but one form of it, arragonite—and the mineral matter of shells resembles arragonite according to Mr. Macalister—forms right rhombic prisms of 116° 5′ and 63° 55′ which might on a casual view be considered cubes by an observer.

Mr. E. J. Lowe says "a pair of *H. aspersa* having been procured in the act of copulation on May 19th, 1882, they were placed in confinement. Each individual produced about 70 eggs which began to hatch on the 20th of June: these young ones grew but little during the summer. They buried themselves in the soil on the 10th of October, coming again to the *surface on the 5th* of April, *not having grown during the winter.*

In May they buried themselves with their heads *downwards* appearing again in a week double the size: this process was carried on at about fortnightly intervals till July 18th, when they were almost full grown."

Shell.

SHELL conoidly-globose, somewhat solid, greyish yellow, with four dark spiral bands, varying in width and intensity of color (the second band is broadest and is formed by the fusion of the two which are second and third in the var. *zonata* Moq.), there are also a number of zigzag yellowish markings or flammules, more or less connected; whorls $4\frac{1}{2}$, very convex, increasing rapidly, the last very large, not carinated, descending abruptly at the aperture; apex smooth, the striæ of growth well and strongly marked upon the antepenultimate whorl, gradually obscured by coarse irregular wrinklings, the striæ being distinctly marked only at the sutures, around the umbilical region and near the aperture; epidermis rather thick; aperture oblique, roundish oval; outer lip white, moderately thick and reflected; inner lip usually thin and spread on the penultimate whorl; umbilicus very perceptible in half grown shells, less so in those of smaller size, and in the adult entirely covered by a fold and thickening of the pillar lip.

Ordinary weight 20—35 grains (Ashford).

Diam. 35 mill.; alt. 30 mill.

Variation.

A number of varieties are enumerated but there are some very interesting forms which I have not seen, these I leave to be differentiated at some future time or by other writers.

Miss Hele writes me regarding the general character of the species in different localities, describing the form prevalent near Bristol as "dark colored"; about Weston-super-Mare it is brown with black markings; near Bath very pale and much mottled; at Cheddar the shells are very solid and large; but at Clevedon no special peculiarity has been noticed.

Mr. Ashford says that the lip is sometimes pink, and occasionally—when the ground color of the shell is unusually dark—pinkish purple.

Rev. J. McMurtrie describes a number of variations from various localities, some of these appear to be transitional only, but it is not always possible to state definitely from descriptions only.

Var. **maxima** n. v. Shell larger. Diam. maj. 48, min. 32, alt. 38 mill.

I have specimens from Algiers received from Mr. Verkruzen which I have distinguished by the above name. The two specimens I possess are differently marked—one belonging to *grisea* and the other approaching the var. *albofasciata*. M. Abbe Dupuy has found at Preste, Pyrenées-Orientales, some examples which attain the dimensions of the largest Algerian specimens. Miss Hele writes : " In Algiers they soon thrive, and I have enormous shells from there whose forefathers were true-born English snails."

The Rev. W. C. Hey informs me he has found very large specimens at Pickering, Yorks. The largest English specimen I have was kindly given me by Mr. Vaughan, of London, and is 40 mill. in diam. It is from the neighbourhood of London.

Var. **minor** Picard. Shell smaller. Diam. maj. 28, min. 23, alt. 22 mill.

I found a specimen of this in 1875, at Riccall, Yorks. On the coast at Mudeford and Christchurch, Hants. ; Weymouth Wareham, and Torquay, Dorset, (Ashford). Specimens from this latter locality weigh from 6 to 8 grains. Miss F. M. Hele has kindly given me specimens from Bristol and Carlisle ; Mr. R. M. Christy, one from a roadside hedge at Chelmsford ; Mr. Madison, some found at Salford Priors, Worcestershire. and Mr. Roebuck, one from Eglwys Rhos, Llandudno. The Rev. J. McMurtrie has found specimens near Arnold's Pond, North Guernsey. Island of Herm (Cooke and Gwatkin).

France (Moquin-Tandon). M. Abbé Dupuy has found some very small specimens at Preste (Pyrenées-Orientales), and Mr. R. Scharff has given me two specimens from near Bordeaux, one of which has the markings of var. *zonata*, and the other of var. *albofasciata*.

Var. **conoidea** Picard. Shell elongately conoid, with a small mouth (=var. *conica*, Gassies).

Dr. Jeffreys says: "Sandhills and cliffs at the sea side." One specimen at Bridlington (Rev. W. C. Hey). General in hedges near Bristol (J. W. Cundall); and I have specimens from Folkestone, kindly given me by Mrs. Fitzgerald. Plentiful at Castle Hill, &c., Tenby (G. S. Tye). Two specimens from a wall on damp ground near Arnold's Pond, North Guernsey, dwarfed in size, alt. 21 mill., breadth 15 mill. (McMurtrie).

France (Moquin-Tandon). M. Gassies records it as var. *conica* from the Agenais.

Mr. Ponsonby has kindly given me a specimen from the province of Constantine, Algeria.

Var. **globosa** Pieard. Shell larger and more globular (=var. *depressa*, Gassies.

Mrs. Fitzgerald says: "On the high chalk hills near the sea a large form is found with a very small depressed spire and very ample mouth"—doubtless this variety.

France (Moquin-Tandon). M. Gassies records it from the Agenais as var. *depressa*.

Specimens kindly sent me from Capetown by Dr. Gibbons are of this form though rather less than the usual size.

Var. **tenuior** Shuttl. Shell smaller, very thin and transparent (=var. *tenuis* Jeffr.).

Downs, on the south coast of Guernsey, from which place I have specimens kindly given me by Mrs. Fitzgerald. Cobo Bay (Rev. W. C. Hey). Mr. Ashford has found a specimen weighing only three grains at Weymouth, Dorset.

The Rev. J. McMurtrie writes: "At Moulin Houet Bay, South Guernsey, the specimens are fine, very thin, and beautifully marked, and abundant among furze in the open, but those taken from the foot of a wall built with lime are not nearly so thin. On a ruined cottage at Icart, amongst crumbled mortar, the specimens are almost of usual solidity. Lime is however present in the soil everywhere, for where *H. aspersa* is thinnest *H. nemoralis* is of usual thickness. Found also in the Island of Herm: near the landing place, where there is no drifted shell sand, the shells are very characteristic; but behind the shell beach, where the soil is largely mixed with drifted shell sand, the shell is of nearly usual thickness. In Sark it is very common and takes the place of the type, with which it is connected by intermediate forms."

This variety has been several times recorded for Yorkshire, but without sufficient foundation.

Has been found at Bastia, Corsica (Romagnoli).

Var. **zonata** Moq.-Tandon. Shell pale yellowish or reddish with five narrow spiral bands (=var. *rufescens* s.v. *fasciatus* Picard.=var. *quinquefasciata*, Requien=var. *fasciata*, Gassies).

Mrs. Fitzgerald and Miss Fairbrass have kindly given me specimens from the Folkestone Chalk Hills. Miss F. M. Hele informs me that she once found a shell at Cheddar, in Somersetshire, and the Rev. J. McMurtrie describes specimens from Alnmouth, Northumberland, which would appear to be this variety.

Throughout France (Moquin-Tandon). M. Gassies records it from the Agenais as var. *fasciata*; and M. Requien and others have found it in Corsica at Bastia, Corte, Ajaccio, Bonifacio, Vico, and Sartène.

Var. **undulata** Moquin-Tandon. Shell smaller, thin, transparent, reddish, with longitudinal undulatory wrinklings, brown and white (=var. *concolor pallida* Shuttl.).

Mr. James Abbot of Leeds has found a specimen of this variety at Redcar, and Mr. Hudson of Middlesbrough has collected some, though not characteristic, at the same place. Mr. W. Cash has collected it at Longueville, Jersey, and the Rev. J. McMurtrie at St. Heliers, in the same island.

Corsica (Blauner).

Var. **nigrescens** Moq-Tand. Shell blackish or very smoky brownish-black, nearly unicolored.

Miss F. M. Hele informs me she has found a specimen of this variety "literally as black as ink" at Burnham near Bristol.

In France M. Abbe Dupuy has collected this variety of an entirely uniform black at Preste (Pyrenées Orientales); and M. Gassies would seem to record it from the Agenais as var. *brunea*.

Var. **obscurata** Moq-Tandon. Shell dark reddish, with broad pale-brown bands, more or less indistinct.

The Rev. J. McMurtrie describes specimens from Arthur's Seat, Edinburgh, as "uniform dark-brown, whitish bands very indistinct," which I incline to regard as this variety.

Toulouse, France (Moquin-Tandon).

Var. **flammea** Picard. Shell reddish, without distinct bands, but with longitudinal flames, more or less interrupted.

I have by the kindness of Miss Fairbrass seen specimens—collected by herself at Droitwich—which I refer to this variety.

The Rev. J. McMurtrie writes that at North Berwick, Haddingtonshire, he has found shells "brown, semitransparent, white in patches, giving the shell a piebald appearance." These may be this variety or an approach to it.

France (Moquin-Tandon).

Var. **marmorata** Moquin-Tandon. Shell greyish or fulvous, marbled with brown.

Toulouse, France (Moquin-Tandon).

I have not seen a satisfactory British specimen of this variety.

Var. **grisea** Moquin-Tandon. Shell of a fallow or greyish colour, with extremely pale and indistinct bands.

Miss F. M. Hele has found this variety in Leigh Woods, near Bristol, and I am indebted to her kindness for specimens from that locality. Mr. W. Jeffery says: "Occurs sparingly

near the Downs, West Sussex"; Capt. Beechen has found it at Clayton, Mrs. Fitzgerald at Folkestone, and Mr. A. Loydell at Worthing, all in the same county; Mr. Ashford has found it at Dorking, Surrey.

The Rev. A. M. Norman remarks on some remarkably pale specimens on a hedgebank at the foot of Watlington Hill, Oxfordshire, which were probably this variety.

The Rev. J. McMurtrie describes specimens from Norfolk and Tenby as "light-coloured and so approaching var. *exalbida*," of which he regards them as a sub-variety. I am inclined to consider them as the var. *grisea*.

Found in France at Toulouse (Moquin-Tandon), and at Bordeaux (Scharff).

Var. **albescens** Picard. Shell whitish, banded or flammulated with reddish.

Rev. J. McMurtrie has found at Cromer and Thorpe, Norfolk, some shells which he describes as "pale yellow with light-brown, non-transparent marblings," and regards as a variety of *exalbida*. Judging from description only, I am inclined to consider them as variety *albescens*.

France (Moquin-Tandon).

Var. **albofasciata** Jeff. Shell reddish-brown with a single white band.

Dr. Jeffreys says "rather local but not uncommon."

Mr. Ashford has kindly sent for my inspection a specimen of this variety from Carisbrook Castle, Isle of Wight.

Mr. Hopkinson, of Watford, has also sent me an immature specimen found near Red Wharf Bay, Anglesea, but the band in this shell is tinged light yellowish grey.

"Several near Mansfield, Notts." (E. Pickard); not uncommon at Godalming, Surrey (H. W. Kidd); a colony at Worthing, in Sussex (A. Loydell); Westbury-on-Trym, near Bristol (Cundall); and the Rev. W. C. Hey informs me that he has taken a "variety with a light band," at Gt. Orme's Head.

I have not been so fortunate as to see any but the two specimens referred to above, and am inclined to think there are some errors made in its identification, as I have at different times had several specimens sent under this name none of which appertained to the variety.

Var. **unicolor** Moquin-Tandon. Shell of a clear uniform fallow or fulvous colour, without traces of the spiral banding.

Found by Mr. S. Tuke at Torquay (C. Ashford), and I have specimens found by Mr. Madison of Birmingham, at Horn Dean, Hants., which he kindly presented to me.

Found in France at Toulouse (Moquin-Tandon) and at Bordeaux (Scharff). From the latter locality I have a specimen kindly given me by that gentleman.

Var. **virescens** Moquin-Tandon. Shell of a uniform greenish-yellow (= *virescens concolor* Requien).

Mr. J. E. Harting, in his account of "The Land and Freshwater Mollusca of Sussex" says: "specimens of a pale yellowish-green have been met with inland at Cowfold."

At Mr. Harting's request, Mr. Borrer, the collector of the specimen, kindly sent it for my examination. The greenish tinge at the time of my inspection was very faint, but if as is possible the green tint has faded to some extent, it must be referred to this variety.

It has also been recorded from Bastia, Corsica (Requien).

Var. **exalbida** Menke. Shell whitish or yellowish with translucent markings.

Dr. Jeffreys says "rather local but not uncommon." The Rev. W. C. Hey records a colony on a bridge-bank near Bridlington Quay, Yorks., where he had taken them for several years, always in exactly the same spot. Miss F. M. Hele finds it in the neighbourhood of nettles and ivy at Leigh Woods, Clifton, where it was discovered by Miss Hele; as many as twenty have been taken in a single evening, but the chief locality is now

destroyed, being covered by a flourishing street of small shops. I am indebted to her great kindness for specimens from the locality. Westbury-on-Trym, near Bristol (Cundall). Stroud (Elliott). Cheltenham (Simpson). Dorking, Surrey; and Staffordshire (C. Ashford). In Kent, Miss Fairbrass finds it near Faversham, Mrs. Fitzgerald on the chalk-hills, Folkestone, and Mr.T. D. A. Cockerell writes that he has recently found it somewhat commonly in one place near Dartford. Mr. Bridgman has found it under hornbeam hedges near Norwich, and Rev. J. McMurtrie has found them, but only rarely, on hawthorn hedges and nettles near the sea at Cromer, Norfolk. Two specimens have also been found by Mr. Blatch near Cambridge. Half-a-dozen specimens on a hedge-bank at the foot of Watlington Hill, Oxfordshire (Norman).

In Scotland Dr. F. Buchanan White says that it "occurs on the sea-coast."

In Ireland Miss Amy Warren records it from the ruined walls of Moyne Abbey, Killala, co. Mayo.

M. Gassies records it from the Agenais as var. *luteola*, and Moquin-Tandon gives Bastia and Sartène as localities.

Miss F. M. Hele writes me "I have easily bred *H. aspersa*, but variety *exalbida* degenerates into a shell covered with a dirty browny-yellow epidermis, instead of the exquisitely delicate lemon hue found on them in their wild state; I have thought that feeding them on lettuce may produce this change of coloring, as the more lettuce I gave mine the darker and dingier the epidermis became."

Monst. **sinistrorsum** Taylor. Shell reversed.

One on Redcar Sandhills, Yorkshire (Rev. W. C. Hey); Goole, Yorkshire (G. H. Parke); one at Christchurch, Hants., during present year (C. Ashford); garden at Notting Hill, London (H. Adams); three specimens near Epsom, one at Little Brookham, and one at Uppingham, Rutland (Daniel); Dartford (Dr. Latham)

Miss F. M. Hele says "I found near Bristol a very beautiful mature reversed specimen, unfortunately dead and slightly injured. I had a similar specimen sent me from Bath not long after, and my sister, Miss Jessie Hele, has found one at Westbury. She tried to increase the variety, but it was of no avail, the eggs when hatched always producing dextral shells.

Dr. Jeffreys says Mr. Bridgman reared a young one to maturity on cabbage and lettuce leaves. The specimen will probably have been found near Norwich.

In France it has been found at Dax, Le Mans, and other places, and Dr. Jeffreys states that M. D'Orbigny had a colony in his garden at Rochelle.

Monst. **scalariforme** Taylor. Shell with the spire produced and whorls disunited.

Dr. Jeffreys, Rimmer, &c., merely remark that this monstrosity occasionally occurs, but give no further particulars.

Miss Hele writes in reference to this form: "I have found near Bristol two shells approaching the ram's horn variety shown in the British Museum. One I have in my collection, the other I unfortunately lost through an accident.

In the Journal de Conchyliologie an account is given of a specimen of this form, which was entirely detached from its shell and continued healthy and active.

Animal.

The body is oblong, narrow, rounded in front and pointed behind; of a blackish-grey on the anterior upper surface—sometimes yellowish-green, occasionally with the head fawn coloured and the body pellucid lavender-grey—with about fourteen oblique rows of oblong, but irregularly shaped tubercles on each side, the summits of which are perceptibly paler. Towards the margin of the foot and the ends of the body the colouring is paler and has often a greenish or yellowish tinge, the granulations becoming more rounded and closer.

The dorsal line of tubercles are noticeably paler than the adjacent parts. Upper tentacles long and slender, divergent very finely tuberculous and similar in colour to the back, bulbs well defined and globular, with the black ocular speck at their extremity. Lower tentacles about a quarter the length of upper pair, only slightly bulbous at the extremity. Mantle of a blackish-grey, closely and finely sprinkled with pale greyish-yellow.

Anatomy.

I am indebted to Mr. Scharff and Mr. Ashford for much of the following complete account of the anatomy of this species:—

THE JAW is described and figured by Binney, Moquin-Tandon, and other authors, as having six or eight separated ribs similar in character to *H. arbustorum*.

My own observations do not agree with these results, the thickenings appearing to be more of the nature of folds, as an examination of the plate will show.

The jaw is 3 mill. wide, strongly arcuate, high and thick, ends rounded, somewhat attenuated with six decided denticulations, most strongly pronounced on the convex margin, there are four other indistinct crenulations in addition to the central rib. The color is yellowish-horny, deepening in the thicker parts of the jaw to dark black-brown, the striation is most visible on the upper part and is parallel with the margin.

THE LINGUAL RIBBON is long and narrow, the formula in specimen examined by me was $\frac{34—1—34}{141} = 9729$.

The central tooth has a base of attachment longer than wide, with a concave lower margin, the upper margin is broadly reflected with a stout median cutting point, which has also a small lateral one at each side.

The *Laterals* have the lower lateral angle of the base of attachment deficient, a little further in the series a second outer cutting point is developed, which gradually approximates in size to the first one.

The outermost rows or marginals are low and wide, bearing one outer bifid cutting point, and a second—sometimes bifid—side cutting point.

DIGESTIVE ORGANS. The mouth lies at the anterior end of the body. We find here a structure characteristic of the whole group of the Odontophora, viz., the tongue which is attached to the floor of the mouth. This apparatus, lying in what is called the buccal mass, consists of a skeleton ; of a subradular membrane, which is continuous with the lining of the oral cavity ; of the radula or lingual ribbon ; and of intrinsic and extrinsic muscles. The food, after having been subjected to the rasping action of the radula as well as to the saliva, finds its way into the oesophagus. The succeeding enlarged portion of the alimentary canal has often been termed the 'proventriculus,' and on it we find two well-developed salivay glands whose ducts open into the buccal mass. The proventriculus is only distinguishable from the stomach by a slight indentation. The intestine leaving the stomach coils round several times, being quite enveloped in the large brownish-coloured liver. It ultimately passes along the respiratory chamber, the anus opening at the respiratory orifice. There is also a kidney in close proximity to the heart.

RESPIRATORY ORGAN. Aerial respiration is effected by the walls of a pulmonary chamber which is a modification of the pallial cavity. Air enters by the respiratory orifice and the blood which finds its way into the numerous vessels in the mantle-roof is thus purified.

CIRCULATORY SYSTEM. As in most of the odontophora there is a single auricle and ventricle in the heart. The purified blood is collected from the respiratory chamber into one large blood-vessel which sends its contents to the auricle. Every contraction of the auricle forces a stream of blood to the ventricle which again propels it into a main efferent vessel. This soon divides into two branches—the hepatic artery and the aorta, one supplying the viscera and the other the anterior

regions. The aorta in going to the head traverses the nerve ring.

NERVOUS SYSTEM. This consists of a nerve collar surrounding the oesophagus. Anteriorly we have the cerebral or supra-oesophagial ganglion pair, giving off a pair of nerves to the buccal ganglia on the ventral surface of the buccal mass. They also supply the great and small tentacles with nerves. The infra-oesophagial ganglion represents the pedal, parietal and visceral which are all fused into one mass. Several nerves are given off from this to the foot and other parts of the body.

GENERATIVE ORGANS. *H. aspersa* is monoecious, the male and female reproductive organs being found in the same individual. There is a generative gland termed the ovotestis or hermaphrodite gland situated behind the liver in the smaller convolutions of the shell. It develops both spermatozoa and ova, but at different periods. The ovisperm duct leaving it, soon divides into a female portion which has thick glandular walls and a more slender male portion or sperm-duct. A large albumen gland sends its contents into the former. This division into two canals is at first only partial, but lower down they become completely divided. The sperm-duct opens into an eversible portion or penis, to which a long flagellum is attached, while the oviduct leads to a large chamber termed the 'vagina.' Sperms received during copulation pass up through the genital opening into the vagina, and are thence conveyed by a spermatophore through the spermathecal duct into the spermatheca, where they are stored up for future use. There is also an appendix attached to the duct. Lastly we have to mention the dart-sac containing a calcareous spicule known as the dart, and two digitate, dilutant, or mucous glands, both opening into the vagina.

DART-SAC single, club-shaped, whitish or greyish-white at all ages. Outer coat thick, tough, whitish, somewhat transparent; inner coat whitish, vascular, or puffy. Length 10—11 mm. To each side of the base of the sac is attached a

"mucous gland." These are much ramified, offering about 25 branches in each bundle, but the number is so variable that scarcely two individuals can be found agreeing in this respect. *H. pomatia* is the only British species which surpasses *H. aspersa* in the number of these curious cœca.

DART single; shaft calcareous, opaque, white, curved, more or less tubular, points at the free end, expanding into a somewhat conical semi-calcareous base. Blades four, symmetrically arranged, semi-transparent, simple-edged, disappearing very gradually towards the point, somewhat more abruptly towards the base which they do not reach, generally connected with each other by more or less numerous (4—12) thin, transparent, lunular, inclined, transverse plaits, like dried mucus (which perhaps they are). Length 8—10 mm.

The dart of *H. aspersa* belongs to a type whose characteristics are shared by only one other British species, viz., *H. nemoralis* (proper). Examination of a number of specimens leads to the conclusion that the blades are the last parts formed in the course of growth, but they invariably remain simple-edged. Montagu is not so exact as usual when he describes the dart of the species as "somewhat triangular," and Dr. Gray is misleading when he calls it "exactly square with four sharp angles." Lister's figure is poor, but probably represents faithfully the image in a microscope of that day. The possession of the weapon is not essential for the proper union of two individuals, for they sometimes unite before the dart has even commenced its formation. The statement is incorrect that *H. aspersa* is provided with its spiculum only during the spring pairing-time. Those which escape its loss during that period retain the weapon throughout the autumn and succeeding hibernation. When first dissected the dart of *H. aspersa* is soft and flexible but it soon hardens with exposure to the air.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting,

HELD AUGUST 2ND, 1883.

Mr. W. Denison Roebuck presided. Correspondence was read from Messrs W. Cash, F.G.S., J. W. Cundall, J. W. Davis, F.L.S., and the Linnean Society of New South Wales. The following

DONATIONS

were announced :—

"Proceedings of the Linnean Society of New South Wales," vol. vii., part 4; "Abstract of the Proceedings of the Linnean Society, New South Wales," June, 1883; "Transactions of the Yorkshire Naturalists's Union," part vi.

NEW MEMBER.

Mr. W. Coates, of Linthorpe, Middlesbrough, was elected a Member of the Society.

PAPERS READ.

The variation in the coloration of the animal of *Planorbis contortus* (Linn.)—by Mr. W. Nelson. Alteration in the molluscan fauna of a small pond—by Mr. W. Nelson.

SPECIMENS EXHIBITED.

Mr. Nelson showed fine specimens of *Planorbis corneus* from Strensall near York, *Limnæa glabra* var. *elongata* found associated with *Planorbis spirorbis* at the same place, also *Limnæa glabra* found associated with *Planorbis spirorbis* and *Physa hypnorum*, at Woodhall Bridge near Wetherby.

Mr. J. W. Taylor exhibited on behalf of Miss Fairbrass of Faversham a number of shells from that neighbourhood including *Helix nemoralis* vars. *olivacea*, *libellula*, and *rubella*; *Helix hortensis* vars. *lilacina*, *lutea*, and *incarnata*; *Helix Cantiana* and var. *rubescens*; *Helix virgata* vars. *albicans* and *subalbida*; *Anodonta cygnea* var. *Zellensis*; and *Succinea Pfeifferi*; also a number of *Limnææ* from various localities, the most remarkable being a short obese form of *L. palustris*, which he proposes to distinguish as var. *obesa*. Mr. Taylor further showed

living *Testacella haliotidea* var. *scutulum* from Lewes, Suffolk, on behalf of Mr. Hillman; and *Limnæa peregra* var. *lacustris* collected by the Rev. A. Merle Norman at Windermere.

Mr. Roebuck showed a number of shells, mostly of the genus *Clausilia* and its allies, collected in Oxfordshire, Sussex, Surrey, and other counties, sent by Mr. S. S. Pearce, B.A.

Meeting,

HELD AUGUST 30TH, 1883.

Mr. J. W. Taylor in the Chair. Correspondence was read from Mr. W. Jeffery, Ratham, and circulars from the Editor of "The Scientific Roll," and the Secretary of the Local Scientific Societies' Committee of the British Association.

DONATIONS

were announced as under:—

"Report of the Wagner Free Institute, U.S.A."; "Report of the Local Scientific Societies' Committee of the British Association"; "Report of the Third Conference of Delegates from Scientific Societies," held at Southampton, August, 1882; and a living specimen of *Planorbis complanatus* monst. *terebrum* (Turton) from Mr. W. Jeffery, Ratham.

SPECIMENS EXHIBITED.

Mr. J. W. Taylor exhibited on behalf of Mr. Hillman, of Lewes, a collection of the shells of that neighbourhood, amongst which were the following:—*Helix arbustorum* and vars. *flavescens* and *marmorata*; *H. nemoralis* and vars. *rubella* and *libellula*; *H. hortensis* and vars. *lutea* and *arenicola*; *H. virgata* vars. *major* and *minor*; *H. ericetorum* and vars. *alba* and *minor*; *H. cartusiana* and var. *rufilabris*; *H. caperata* and var. *ornata*; *Neritina fluviatilis*, *Pupa secale*, *Planorbis lineatus*, *Helix rupestris*, and *Cochlicopa tridens* and vars. *crystallina* and *Nouletiana*.

Mr. C. Ashford sent *Neritina fluviatilis* var. *cerina* from the R. Stour near Christchurch, collected in Sep., 1881; a scalariform specimen of *Succinea putris* tending to monst. *spiralis*; also *Clausilia gibbula* from Dalmatia.

Mr. S. A. Stewart, of Belfast, sent living *Helix fusca* from Cave Hill, near Belfast.

THE DARTS OF BRITISH HELICIDÆ.

By CHARLES ASHFORD.

PART II.

In the last article on this subject a general description was given of the form, structure, and economy of the dart and its sheath. I will now proceed to the peculiarities of the organ in the different species, and in doing so shall not attempt any particular arrangement beyond that of considering first our two dart-bearing species not included in the genus Helix.

1. **Zonites nitidus** Müller, pl iii. figs. 1—4. DART-SAC long, slender, with a single reflected or pendent lobe at the free end; whitish, semi-transparent. DART filiform, curved, twisted, without blades or annulus; length not quite 2 mm.

This was the first European species of Zonites ascertained to possess a dart, and the fact was published by Dr. Lehmann in a communication to the 'Malakozoologische Blätter' for 1862, but without a figure. On the ground of the peculiarity Lehmann proposed to constitute a separate genus for the reception of this species under the name of "Zonitoides."

In its organization it forms a link between Helix and Zonites, showing its alliance to the former by the dart and long spermatheca-duct, and to the latter by the teeth of the lingual ribbon, which resemble those of *Z. crystallinus* (Goldfuss), by the form of the shell and jaw and by the absence of mucous glands. In the place usually occupied by mucous glands when a dart-sac is present, is a small oval fold of a dirty greenish-grey and spongy appearance, overlying the vagina and lower portion of the spermatheca-duct. This fold occurs also in several members of the genus Zonites not provided with darts—notably in *Z. cellarius*—and is considered by Moquin-Tandon to be the analogue of the mucous glands.

The dart-sac of *Z. nitidus* differs from that of any British Helix by its recurved extremity (fig. 1) and by the presence of a slender filament (muscle?) attached to the terminal part of the sac. The retractor muscle of the penis-sheath joins that of the dart-sac and the common part above is attached to the spermatheca-duct. This arrangement bears a striking resemblance to that described and figured by Leidy (in Binney's "Terrestrial Air-breathing Mollusks of the United States" 1851) as existing in the transatlantic forms *Helix intertexta* and *H. suppressa.* In the earlier stages of growth of the dart-sac the pendent lobe is not always observable but the connecting filament appears to be always present.

It is with some hesitation I give fig. 2 as representing the fully formed dart in British specimens not having had the opportunity of comparing a series. Out of about one hundred individuals obtained from Yorkshire and Hampshire in July and August only one had a dart. The rest, with few exceptions, had the sac in a very early stage of development though the shells in most cases were apparently mature. Lehmann describes the dart of German specimens of *Z. nitidus* as having the base funnel-shaped and the head slightly lancet-shaped. I have no reason to suppose that British specimens are otherwise, when matured, and therefore think it highly probable the form represented in fig. 2 is that of a dart not fully completed.

The figures are drawn from specimens kindly sent me from Beverley by Mr. Darker Butterell of that place.

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2. **Zonites excavatus** Bean, pl. iii., figs. 5—10. DART-SAC long, slender, with a bi-lobed, pendent free end; pearly white, nearly transparent. DART with a filiform, curved, twisted shaft, slightly flattened and widened towards the point; base rather abruptly expanded; without blades or annulus; length 2 to 2·5 mm.

Till the present year the last species has been considered to afford the only instance of a European Zonites furnished with

a dart. *Z. excavatus* now keeps it company. The two species present a strong family likeness in their internal organisation. The duct of the spermatheca is as long as the oviduct, contrasting with the short, thickened peduncle of *Z. cellarius*, *Z. nitidulus*, and *Z. alliarius*. In both the oviduct is of a bluish grey or slate colour. The inferior half of the penis-sheath is dilated and there is no flagellum. The pendent extremity of the dart-sac is also common to both.

The dart-sac of *Z. excavatus* (fig. 5) is unique in form. As was pointed out in the introductory article, a few of our Helices have an accessory lobe attached to the organ, but in all such cases it lies between the teliferous sac and the vagina and is more or less fused to the latter (pl. ii., fig 3). In the present species the secondary lobe is in no way connected with the vaginal tube. It appears to be of later growth, being absent up to a certain stage of immaturity. A slender filament (muscle ?) connects the main pendent lobe with the oviduct, at least in some cases. A retractor muscle to the dart-sac does not occur among the British Helices, and, according to Schmidt, is unknown in any Helix of the Eastern hemisphere. In this respect the two Zonites under consideration show more affinity with American forms.

There are no mucous glands, but an oval mass of a greenish-yellow colour, similar to that described under *Z. nitidus*, occupies their place.

The dart (fig. 6) is an exquisitely delicate little weapon, and long for the size of the animal. The head is slightly compressed and dilated (fig. 8), the amount of compression varying in individuals according to a greater or less approach to maturity. The degree of twist from the plane of curvature (fig. 7) is not always the same. The curve of the shaft is usually an arc of about 60°, but I have met with more than one instance in which there is a sub-angular bend just below the head. The dart springs from a tubercle situated, not at the extremity of

the sac, but near the commencement of the reflected part (fig. 9). The white shaft and dilated base are clearly seen through the pellucid coats of the sheath. No instance of a decidedly immature dart has occurred to me.

The figures are drawn from specimens obtained near Barton in Hampshire.

Out of a large series of individuals of this species examined in May, June and July, scarcely 10 per cent. furnished darts. Shells which have lost their brilliancy and assumed a dull, dirty yellow appearance will best reward the dissector. The small number reaching sexual maturity in the months mentioned is in striking contrast to what is observable in most species of land snails. In this respect the present species again resembles its congener *Z. nitidus*.

It will now be a matter of interest to ascertain whether those continental forms which the author of British Conchology considers to be varieties of this species are or are not furnished with a dart of this description. I refer to the *H. viridula*, Menke and the *H. vitrina* Fér.

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3. **Helix virgata** Da Costa, pl. iii., figs. 11—17. DART-SAC broadly oval, but rather irregular in outline, united throughout most of its length to the vagina; occasionally obtusely notched at its free-end; yellowish white. DART with a stout, curved shaft, increasing gradually from point to base; furnished with two thin, transparent, simple-edged angulated blades; Length 2 to 3 mm.

The dart of *H. virgata* is the sole British representative of a peculiar type remarkable for its heavy shaft and angled blades (fig. 13, 14). The angle occurs near the point and from it the edges of the two blades converge rapidly, in nearly straight lines to the point, which they reach. Below the angle referred to, the edges trend gradually downwards in nearly parallel curves, disappearing about half-way down the dart (fig. 15). In less

mature examples the blades do not extend more than a third or a quarter of the length, and at a still earlier stage no blades are visible (fig. 16). The shaft is usually marked transversely with coarse, irregular bands or ridges, resembling lines of growth, at unequal distances from each other and varying in depth of whiteness (fig. 17). I have found no annulus. The base is the widest part of the shaft but there is no abrupt expansion.

The inner sheath of the sac tapers to a point, rendering it very difficult to extract the dart by dissection. In using a solution of caustic potash to dissolve the integuments care must be taken to wash the dart well, when free, otherwise the transparency of the blades will be impaired by the formation of minute white crystals upon their surface as the solution dries.

Schmidt (Stylomm. pl. vi., fig 40) represents the dart-sac of a variety of *H. variabilis* from Burriana with the free end deeply bi-lobed and the whole sac of a slenderer shape. No such form has occurred to me among British specimens, though an incipient notch may occasionally be met with (fig. 12) showing a tendency to such a form as Schmidt illustrates.

I have examined a considerable number of *H. virgata* from various localities including the var. *submaritima* from the Isle of Wight and a small form kindly supplied by Mr. Ponsonby from near Yeovil, Somersetshire, but have met with no departure from the type of dart. The size varies much but is always in proportion to the bulk of the animal.

In the months of July, August, and September about 95 per cent of individuals with completed shells have furnished darts.

Neritina fluviatilis var. **cerina** Colb. **in Hampshire.**—Through the courtesy of my esteemed correspondent Mr. C. Ashford, of Christchurch, I am enabled to add South Hants. to the locality previously recorded for this pretty variety. Mr. Ashford has kindly sent me a small specimen found by himself in the river Stour near Christchurch in September, 1881.—*J. W.* TAYLOR, Sep. 6th, 1883.

CARNARVONSHIRE NOTES, JULY, 1883.

By W. DENISON ROEBUCK.

During the month of July I visited various parts of Carnarvonshire, noting such mollusca as I came across. Conway Castle and the banks of a small stream which runs through the town were visited upon one occasion, and on another the church of Llangelynen, a few miles S.W. of Conway. A walk from the landing place at Trefriw along the old road to Llanrwst yielded me the interesting new variety of *Arion ater* cited in the list, but not very much else, the Silurian slates appearing to be very unprolific in mollusca. This walk showed somewhat forcibly the influence of man's handiwork upon the presence of mollusca, for after a long dreary and unproductive walk along a road where no human habitations existed, I found various species thickly congregated together amongst the rank vegetation and under stones immediately surrounding the old disused turnpike gate called 'Gwydir Gate,' all within the space of a very few yards. The same was the case in and about the buildings of the Dinas railway station near Carnarvon, where I twice had half-an-hour to wait for trains. The walk from Rhyd-ddu station to Beddgelert and Pont Aberglaslyn—Silurian slates again—was also unproductive of mollusca, *Arion ater* being the chief representative. I had not the opportunity of ascending Snowdon or I should have endeavoured to ascertain what mollusca occur at or near the summit. I have put my notes into list form as being more convenient for reference.

Arion ater.—At Beddgelert, and all along the road from there to Rhyd-ddu station, Trefriw, at Gwydir gate, and at Llangelynen; abundant wherever I collected.

Arion ater var. **albolateralis.**—I was pleased to meet with this beautiful form in plenty at Trefriw, and I also found one, a full-grown and seemingly very old specimen, with dulled colours, under a log of wood at Dinas railway station.

Arion ater var. **rufa.**—Brown specimens, more or less intensely coloured, occurred to me at Llangelynen and other places.

Arion hortensis.— A few specimens noted; Beddgelert, Dinas railway station, and Conway Castle.

Limax agrestis.—Abundant wherever I collected. Dinas station, Trefriw, Gwydir gate, Conway Castle and town, &c.

Limax maximus var. **cellaria** d'Arg.—One seen at Trefriw and one in Conway Castle.

Limax arborum.—A young one seen at Trefriw, and in Conway Castle I found a large slug which somewhat puzzled me, but which I am inclined to refer to this species from the pattern of its markings.

Zonites cellarius.—Common, occurring to me at Dinas station, Trefriw, Gwydir gate, and Conway Castle.

Z. glaber.—Common. Trefriw, Gwydir gate, Dinas station, and Conway town.

Z. alliarius.—Not so plentiful as the preceding. I collected a few in Conway Castle and at Dinas station.

Z. alliarius var. **viridula.**—Amongst my specimens of this species collected in Conway Castle is a white example.

Z. nitidulus.—A few specimens at Llangelynen, Dinas station, Trefriw, and Gwydir gate.

Z. crystallinus.—Conway Castle.

Helix aspersa.—Abundant in Conway Castle and town, at Dinas station, and at Llangelynen.

H. nemoralis var. **libellula.**—Conway town (band formula 12345); Llangelynen (00300).

H. nemoralis var. **rubella.**—At Conway town (00300); Llangelynen (00300); and Dinas station (00300, the band very faint, hardly darker than the ground tint).

H. nemoralis var. **castanea.**—Conway town (00000).

H. arbustorum.—A few specimens among nettles at Gwydir turnpike gate near Llanrwst.

H. hispida.—One at Trefriw, and common at Conway Castle.

H. sericea.—Conway town, by sides of a stream, common.

H. caperata.—Conway Castle and town, common.

H. rotundata.—Abundant wherever I collected. Trefriw, Gwydir gate, Llangelynen, Conway Castle and town, and Dinas station.

H. rupestris.—A few in Conway Castle.

H. pulchella.—Conway Castle, one.

Pupa umbilicata. — Dinas station, Llangelynen, Conway Castle and town, abundant.

Pupa umbilicata var. **edentula.**—With the type; Dinas station.

Balea perversa.—A single specimen collected on a slate wall between Beddgelert and Rhyd-ddu.

Clausilia rugosa.—Common at Trefriw and in Conway town.

Cochlicopa lubrica.—Llangelynen and Conway town, common.

C. lubrica var. **lubricoides.**—One at Conway Castle and another in Conway town.

Limnæa truncatula.—One at Llangelynen.

I had intended including notes of observations which I had made in the country in former years, but cannot lay my hands on the specimens or the notes, with the exception of some referring to species collected in Conway Castle in 1877 (nothing additional) and a note that I found in the same year *H. rotundata* at Dwygyfylchi.

Testacella haliotidea v. scutulum in Sussex.—On the 17th of June I found specimens of this species in a garden of my uncle at Lewes. This is the first time I have heard of this species being taken in Sussex. I noticed that they were decidedly sluggish during the day, drawn up as it were into a short lump, but in the evening they crawled about pretty freely.—T. S. HILLMAN, July 31st, 1883.

NOTE ON THE RANGE OF *PALUDINA VIVIPARA* (L.).

By J. W. TAYLOR.

Rimmer in his useful and handy work "The Land and Freshwater Shells of the British Isles" p. 27, credits this species for Scotland, as having been 'found at Findhorn, in the Moray Firth district,' and also adds 'Brown in his 'Recent Conchology' says it occurs in Ireland in a stream at Newtownards, Co. Down.'

Both these records would appear to be erroneous. The Scottish locality is evidently copied from 'British Conchology,' and in that excellent work, the authority for the record—Rev. Dr. Gordon—is given, but it has unfortunately been overlooked by both authors that Dr. Gordon expressly stated that the specimen found was a ballast shell, and therefore not belonging to the district.

The Irish record would also seem to be incorrect but for a different reason. Capt. Brown certainly published *Paludina vivipara* Lam. as occurring at Newtownards, but the species he referred to was the *Paludina contecta* of more modern authors. The *P. contecta* Millet, being synonymous with *P. vivipara* Lamarck, Müller and others. *Paludina vivipara* L. is afterwards referred to as inhabiting England under Draparnaud's name of *achatina*. Mr. Thompson, in his Catalogue of the Land and Freshwater Mollusca of Ireland, remarks :—"Mr. Gray incidentally notices *Paludina achatina* as an Irish species, but on enquiry of him he could not recollect from whom he had received the information." Dr. Gray, however, in his edition of Turton's Manual, gives only *P. contecta* as inhabiting Ireland under the name of *vivipara*; this name being applied at that time to the other species.

It would thus appear that the true *Paludina vivipara* does not yet belong to the faunæ of either Scotland or Ireland, though it is not improbable that it may yet be found in the latter country.—July 30th, 1883.

Alterations in the Molluscan fauna of a small pond.—Some twenty-three years ago I was in the habit of collecting shells in a small pond near to the Black Hills, Leeds. At that time the only molluscan forms found there were a dwarf form of *Sphærium lacustre* Müll., *Pisidium pusillum* Gmelin, *Planorbis nautileus* Linn., and *Limnæa peregra* Müll. About ten years ago I resumed my visits to the locality and found in addition to the species already enumerated *Planorbis corneus* Linn. These were the only species found there until this Spring, when, during one of my frequent visits, I was surprised to find *Physa fontinalis* Linn., and *Planorbis vortex* Linn. were added to the growing list of species. Later on *Planorbis carinatus* Müll., *Limnæa stagnalis* Linn., and *Ancylus lacustris* Linn. turned up; and during June *Planorbis contortus* Linn. was found in this small but prolific pond. My object in writing this small note is to elicit from some of your readers whether their experience furnishes a similar instance of additions to a fauna. I have in my mind more than one case of the partial disappearance from a locality of a species, and sometimes of the total disappearance, but I know of no similar instance of so many additions to the fauna of a small pond. My friends, Mr. J. W. Taylor and Mr. J. Beevers, who collected with me during the years 1860—63, will bear me out that the four species first named above were the only forms at that time in the pond.—W. NELSON, Aug. 1st, 1883.

Bulimus obscurus var. **albinos** Moq.—East Sussex may be added to the list of counties in which this variety occurs, as enumerated by Mr. Taylor at p. 83 of this volume. Mr. S. Spencer Pearce, B.A., took a specimen on a beech tree in a wood at Fitchin near Eastbourne, in September, 1881, which by his kindness Mr. Taylor and I have seen.—WM. DENISON ROEBUCK, Leeds, August 3rd, 1883.

MUSICAL SOUNDS CAUSED BY *ACHATINELLÆ*.

By REV. H. GLANVILLE BARNACLE, M.A.

When serving as astronomer on the Government Expedition to the Sandwich Islands to observe the Transit of Venus in 1874, I took the opportunity of hunting over the Islands for the *Achatinellæ*, so perhaps the following may be of interest to you concerning those beautiful shells. When up the mountains of Oahu I heard the grandest but wildest music, as if from hundreds of Æolian harps, wafted to me on the breezes, and my companion (a native) told me it came from, as he called them, the singing shells. It was sublime. I could not believe it, but a tree close at hand proved it. On it were many of the shells, the animals drawing after them their shells which grated against the wood and so caused a sound; the multitude of sounds produced the fanciful music. I can hear it now as I write, so great an impression did it make on me. On this one tree I took seventy shells of all varieties. At the root in the grass, I took twenty-three more, and everywhere I took some. The British Museum now has eleven sinistral varieties from me that they had not before, but it seemed a shame to rob nature of its notes. It may be of interest to name that wherever I found the *Achatinellæ*, close at hand were always to be found *Helix similis*, and varieties of *Amastra*.—Sep. 3, 1883.

Helix virgata v. major at Eastbourne.—Through the kindness of Mr. S. Spencer Pearce, B.A., I have been favoured with specimens of this variety of a much larger size than I have yet seen recorded. The largest specimen is fully 25 mill. or 1 inch in diameter, and was collected by him 'in cultivated fields at Eastbourne.' These shells are fully one-fifth larger than those recorded by Dr. Jeffreys from Weymouth, which were the finest specimens he had ever seen. The extreme limits of size given by Dr. Gray, Moquin-Tandon, Tate, &c., do not exceed the measurements given by Dr. *Jeffreys*.—J. W. TAYLOR, Aug. 14th, 1883.

BIBLIOGRAPHY.

Mollusca of H.M.S. 'Challenger' Expedition.—By the Rev. Robert Boog Watson, B.A., F.L.S., &c.,—Parts 4—11.

The magnificent results of the cruise of the 'Challenger' in the discovery of new forms and throwing light upon many aspects of Conchology previously obscure, owe much of their value to the untiring. able, and conscientious study bestowed upon them by their talented Reporter. In part 5, Mr. Watson formulates some conclusions he has arrived at from the investigations he is engaged upon.

1.—Depth is an important condition of Molluscan life, there being really shallow and deep water species and genera.

2.—Temperature seems to be even more important than depth.

3.—Great differences in depth and temperature are barriers to distribution.

4.—Living species found also fossil always have a wide local distribution.

5.—Where barriers of depth or temperature do not check dispersal, there seems in ordinary circumstances no limit to universality of distribution.

6.—There are existing species universally distributed, having overcome all obstacles of dispersion.

7.—The absence of any trace of lasting, essential, and progressive change.

The third part is commenced with *Basilissa oxytropis* from Ascension Island omitted from its proper place. Trochidæ follows with 16 species, one being referred to Gibbula—*glyptus* from Sydney. Ziziphinus has three species—*Z. stirophorus* from Culebra; *Z. tiara* from Culebra and the Bermudas; *Z. transenna* from Philippines; Margarita has twelve species, viz:—*T. brychius* from Kerguelen; *T. charopus* from Kerguelen Islands; and var. *cæruleus* from Heard Islands; *T. pompholu-*

gotus, Culebra Island; *T. lima* from the Azores; *T. ægleës*, Culebra Island; *T. clavatus*, Culebra Island and Pernambuco; *T. rhysus*, Setubal and also Sombrero Island, W.I.; *T. infundibulum*, Bermudas and Marion Island; *T. pachychiles*, Philippines; *T. Azorensis*, Azores; *T. duopherus*, off Pernambuco; *T. scintillans*, Culebra Island and Bermudas. There are three Turbos—*T. (Calcar) henicus* from Fiji; *T. transenna* from Japan; and *T. (Collonia) indutus* from Culebra Island.

Another new Siphodentalium—*honoluluense* from Honolulu is described; and *Trochus (Gibbula) leaensis*, Lea point, Cape Town; *T. (Ziziphinus) arruensis*, Arru Islands; *T. (Solariella) philippensis*, Port Philip; *T. (Solariella) lamprus*, Fiji; and *T. (Solariella) albugo*, Port Jackson. Two new Lacunas—*L. picta*, Station 122, and *L. (Hela) margaritifera* from Mid. Pacific, E. of Japan. A new species of Fossarus—*cereus* is from E. of Cape York; and *Jeffreysia Edwardiensis* from Prince Edward Island. Twenty-one new species of Cerithium are next described, viz:—*Cerithium (Triforis) levukense*, from Fiji; *C. (T.) bigemma*, N. of Culebra Island; *C. (T.) hebes*, Nightingale Island; *C. (T.) inflatum*, N. of Culebra Island; *C. matukense*, Station 173; *C. phoxum*, Fiji; *C. (Bittium) lissum*, Fiji; *C. (B.) amblyterum*, Azores; *C. (B.) mamillanum*, Pernambuco; *C. (B.) amboynense*, Amboyna; *C. (B.) pigrum*, Nightingale Island; *C. (B.) luscinicæ*, Nightingale Island; *C. (B.) philomelae*, Nightingale Island; *C. (B.) gemmatum*, Setubal; *C. (B.) pupiforme*, Wednesday Island; *C. (B.) enode*, Pernambuco; *C. (B.) oosimense*, Oosima, Japan; *C. (B.) cylindricum*, Port Jackson; *C. (B.) abruptum*, Azores; *C. (B.) delicatum*, Nightingale Island; and *C. (B.) aedonium*, Nightingale Island. *Litiopa limnæiformis* is from Prince Edward Island; *Cerithiopsis balteata* from Fiji; and *C. fayalensis* from the Azores. Nine species of Turritella follow, viz:—*T. runcinata* and *T. accisa*, S. E. Australia; *T. carlottæ*, S. E. Australia, and Queen Charlotte's Sound, N. Z.; *T. philippensis*, Port Philip; *T. cordismei*, S. E. Australia; *T. austrina*, off Prince Edward Island

and Kerguelen; *T. deliciosa*, Raine Island, N. Australia; *T. (Torcula) admirabilis*, Admiralty Island; and *T. (Torcula) lamellosa*, S. E. Australia.

Three new species of Aclis are described *Aclis mizon*, Teneriffe; *A. hyalina* and *A. sarissa*, Pernambuco. *Fenella elongata*, St. Thomas, W. Indies. *Dunkeria falcifera*, Bermudas. *Natica philippinensis*, Philippines; *N. atypha*, W. of Cape York; *N. pseustes*, Levuka, Fiji; *N. suturalis*, Kerguelen's Land; *N. radiata*, Bermudas; *N. amphiala*, N. E. from New Zealand; *N. leptalea*, St. Thomas, W. I.; *N. xantha*, between Kerguelen and Heard Island; *N. prasina*, Kerguelen; *M. fartilis*, between Marion and Prince Edward Islands; and *N. apora*, off Arru Island. *Oniscia cithara*, Ke Islands, W. of Papua. *Triton Philomelæ*, Nightingale Island. Tristas da Cunha. *Ranella fijiensis*, Fiji. *Nassaria amboynensis*, Amboyna.

The Pleurotomidæ which has yielded so rich a harvest of new forms, has 13 which are referred to Surcula, viz:—*P. staminea*, Prince Edward Island; *P. trilix*, between Kerguelen and Heard Island; *P. lepta*, Southern Ocean, S. E. of Australia; *P. rotundata*, Mid. Pacific, E. of Japan; *P. goniodes*, S. E. of La Plata; *P. plebeia*, off Pernambuco; *P. syngenes*, Sombrero Island, W. I.; *P. hemimeres*, Pernambuco; *P. anteridion*, off Cape of Good Hope; *P. rhysa*, Pernambuco; *P. bolbodes*, Pernambuco; *P. ischna*, N. E. from New Zealand. Three species are referred to Genota—*P. didyma*, Sombrero Island, W. I.; *P. engonia*, N. E. from New Zealand; and *P. atractoides*, Philippines. Thirteen are Drillias, viz:—*P. pyrrha*, Kobi, Japan; *P. paupera*, Arru Island; *P. gypsata*, N. E. from New Zealand; *P. brachytoma*, off Arru Island; *P. fluctuosa*, Kerguelen; *P. bulbacea*, N. E. from New Zealand; *P. spicea*, off Pernambuco; *P. ula*, N. E. from New Zealand; *P. stirophora*, Pernambuco; *P. phœacra*, Pernambuco; *P. tmeta*, off Pernambuco; *P. incilis*, St. Thomas Island, W. I.; and *P. sterrha*, Torres Straits; *P. (Crassispira) climacota*, Tongatabu; *P. (Clavus) marmarina*, Pernambuco. Nine Mangelia are described

under the following names:—*P. subtilis*, Pernambuco; *P. Levukensis*, Levuka, Fiji; *P. eritmeta*, off Fayal, Azores; *P. hypsela*, Pernambuco; *P. acanthodes*, Bermuda and Azores; *P. corallina*, N. of Culebra Island, Danish W. I.; *P. macra*, off the Azores; *P. incincta*, off the Azores; *P. tiara*, N. of Culebra Island, Danish W. I. Two are described as Raphitomas—*P. lithocolleta*, off Sombrero Island; and *P. lincta*, Culebra Island, St. Thomas, Danish W. I. Nine species are referred to Thesbia, these are *P. eritima*, Nightingale Island; *P. translucida*, between Marion and Prince Edward Islands, and Kerguelen; *P. corpulenta*, Kerguelen; *P. platamodes*, Kerguelen; *P. dyscrita*, Sombrero Island; *P. monoceros*, S. W. of Sierre Leone; *P. papyracea*, between Prince Edward Island and Kerguelen; *P. brychia*, Mid. Atlantic; and *T. pruina*, San Miguel, Azores.

Ten species are referred to Defranciæ, as follows:—*P. hormophora*, from off Sombrero and Culebra Island and Pernambuco; *P. chariessa*, from Pernambuco, Palma, and North of Culebra Island; *P. pachia*, N. of Culebra Island; *P. pudens*, N. of Culebra Island; *P. araneosa*, N. of Culebra Island; *P. streptophora*, North Atlantic; *P. circumvoluta*, N. of Culebra Island; *P. chyta*, W. of Azores; *P. perpauxilla*, N. of Culebra Island; and *P. perparva*, Pernambuco. Two Daphnellas:—*P. compsa*, Kandavu, Fiji; and *P. aulacoëssa*, Cape York. Two are Borsonias:—*P. ceroplasta*, N. of Culebra Island; and *P. silicea*, off Pernambuco.

Of the genus Drillia, 5 species and a variety are described:—*P. exsculpta*, N. of Culebra Island; *P. tholoides*, off Pernambuco; *P. amblia*, Culebra Island; *P. aglaophanes*, Culebra Island; *P. lophoëssa*, and var. *platia*, Pernambuco. Clionella with one species *quadruplex* from the Azores, completes the list.

On the Genus Myodora of Gray.—By Edgar A. Smith, F.L.S. From P.Z.S., Nov. 16th, 1880.

This monographic account of the genus *Myodora* gives *the names of* every species with its synonyms, with the original

descriptions of such species as have been described in recent years in publications not generally accessible.

Eight new species are described: *Myodora novæ-zealandiæ*, Stewart Island, New Zealand (pl. liii. fig. 5, 5*a*, 5*b*); *M. subrostrata*, Stewart Island, New Zealand (fig. 6, 6*a*, 6*b*, 6*c*); *M. antipodum*, New Zealand (fig. 7, 7*a*); *M. Boltoni*, New Zealand (fig. 9, 9*a*, 9*b*, 9*c*); *M. proxima*, Japan and China (fig. 8, 8*a*, 8*b*); *M. Reeveana*, China (fig. 10, 10*a*); *M. tenuisculpta* (fig. 11, 11*a*); and *M. compressa* (fig. 12, 12*a*).

Black Sea Mollusca.—By J. Gwyn Jeffreys, LL.D., F.R.S., &c.

The Black Sea is Zoologically an offset of the Mediterranean, the latter and the Sea of Marmora being the links connecting it with the North Atlantic. The Mediterranean and the North Atlantic scarcely differ in their mollusca, as Dr. Jeffreys has previously shown.

The shells which are the subject of present notice were dredged by Admiral Spratt in 1855 off Balaclava, and about sixty miles south-east of the Danube. None of the species mentioned, except *Mytilus edulis*, are included by Middendorf, in his 'Malacozoologia Rossica,' nor mentioned by Weinkauff. The list contains six species, as follows:—*Mytilus edulis*, *M. phaseolinus*, *Cardium fasciatum*, *Scrobicularia alba* var. *curta*, *Cerithium pusillum*, and the new species, *Trophon breviatus* Jeffreys, which is allied to *T. muricatus*, a Mediterranean species.

Les Mollusques Marins du Rousillon.—Par E. Bucquoy, Ph. Dautzenberg, and G. Dollfus. Fasc. IV.

The fourth part of this beautiful work is now before us, and deals with the families *Naticidæ*, and *Pyramidellidæ*. The family *Naticidæ* embraces the genera *Natica* and *Lamellaria*; the first genus including the sub-genera *Nacca*, *Naticina*, *Neverita*, and *Payraudeautia* B.,D. & D. The genus *Lamellaria* contains only *L. perspicua* L., of which however five varieties

are noted. The *Pyramidellidæ* includes the genera *Odostomia* with the new sub-genera *Odostomella* and *Parthenina*, *Turbonilla*, *Eulimella*, *Eulima* with sub-genus *Leiostraca* and *Menestho*.

Sixteen species of *Odostomia* are noticed, of which three are described as new—*O. Monterosatoi*, *O. Penchynati*, and *O. Jeffreysi*, the last also with a variety *flexicosta*.

The execution of the plates continues to be very satisfactory; the photographs of the minute species are however not made from the objects themselves, but from enlarged drawings. J.W.T.

Limnæa peregra v. **Burnetti** Alder.—This variety of *Limnæa peregra* is more local than rare, as it occurs plentifully where it is to be found, the only known localities being Loch Skene, in Dumfriesshire, and a small lake in Breconshire. There is a peculiar interest attached to it, living as it does in lakes among mountains. I have had opportunity of observing it only at Loch Skene where it lives and thrives on 'the rude barriers of the lake' in company with two kinds of trout, the ordinary burn trout and a trout quite peculiar to this Loch, the flesh being red and the fish of singular beauty. The *Limnæa* evidently delights in the Scotch summer mists, for when I visited the Loch one of the mists fell heavily, hiding the mountain, and then it was I secured my finest specimens, these creeping up rapidly from the bottom of the loch to the top of the rocks, where I easily secured them. In sunny weather they appear to be more sluggish, attaching themselves chiefly to the sides of the rocks or resting at the bottom of the loch. Loch Skene is a wild spot, but beautiful in its wildness, charming to the lovers of geology as it reposes among the old Silurian rocks with their grits, graywackes, and lower Silurian shales. Also to the botanist the district has its delights, for here grow among the mosses at its sides the cloudberry (*Rubus chamæmorus*), and the cranberry (*Vaccinium oxycoccus*), and many other interesting plants. *Limnæa peregra* v. *Burnetti* led me

one year, and my sister, Miss Fanny Hele, the following year, to visit Loch Skene, and if it should induce other lovers of conchology to do the same, I can promise them they will never regret the hours spent near the loch, or their endeavours to secure this most interesting variety of *Limnæa peregra*.—(Miss) Jessie Hele, Aug. 14th, 1883.

Limax maximus var. **cellaria** d'Argenville.—I have now to add this to the varieties given in the Conchological Society's List of British Mollusca. I have received it from Ackworth, where it was collected not uncommonly and of large size by my friend, Mr. Hugh Richardson. This was in June, 1883. Since then I have found it myself at Conway Castle, Llangwystenin, and Dinas Station, all in North Wales. In fact I believe it may be considered as one of the common and prevalent British varieties, and the sole reason for its not having been formally placed on record for this country before is simply that the varieties of our British slugs have not been hitherto recorded at all. This was originally described as a species by d'Argenville (1775) under the name of *Limax cellaria*. The characters of the variety are that it is ash-coloured, with the shield spotted with black, and the back with interrupted fasciæ of the same colour, the fasciæ being four in number, according to Pini. I believe it will ultimately be found to occur throughout this country, while on the Continent it has been recorded for Toulouse (Moquin) and for Esino in Lombardy (Pini).—Wm. Denison Roebuck.

Helix rotundata var. **alba** Moq. **in Scotland.**—Mr. Robert Scharff, of Edinburgh, has kindly sent me a living specimen of this variety collected by himself in July of the present year at Arthur's Seat, Edinburgh. This adds another to the recorded localities of this form.—J. W. Taylor, Aug. 8th, 1883.

FLINTSHIRE NOTES, JULY, 1883.

By WM. DENISON ROEBUCK.

Journeying into Wales on the 10th of July, I broke journey at Mostyn and again at Prestatyn, having at each place about three or four hours. At Mostyn I collected in a damp grassy piece of wet land which stretches for about a mile along the west side of the railway. Here I found *Zonites nitidus* in profusion, and also several specimens of *Limax lævis*. They were accompanied by *Z. crystallinus*, *Z. fulvus*, *Z. alliarius*, *Z. cellarius*, *Z. nitidulus*, *Succinea putris*, *Carychium minimum*, *Cochlicopa lubrica* and its var. *lubricoides*, *Helix rotundata*, *H. hispida*, *H. sericea*, *Arion ater*, *A. hortensis*, and *Limax agrestis*, all in greater or less numbers. The old and broken down walls which separated this waste land from the high-road also produced some of these species, together with *Helix caperata*, *Pupa umbilicata*, *H. pulchella* and its var. *costata*. Of *H. nemoralis* I found two specimens, one of them pertaining to the var. *libellula* (band formula 12345) and the other to var. *rubella* (00300), the latter being very brightly coloured. One of the examples of *Arion ater*, a full-grown specimen, was of a very deep, nearly black, chocolate brown, pertaining to the var. *rufa*. I was much interested in watching the very active and lively habits of *Limax lævis*, and also in meeting with such numbers of *Z. nitidus*, a species which has not often happened to me.

At Prestatyn I did not meet with very many things. *Helix aspersa* and *H. caperata* were in great abundance, and in a wood close by the station I found a specimen of *H. nemoralis* var. *libellula* (12345). There also and by road sides I found a few examples of *Pupa umbilicata*, *Clausilia rugosa*, *Helix rufescens*, *H. hispida*, and *H. sericea*.

While on the subject of Flintshire shells I will mention that Mr. Taylor has received from Mr. W. H. Boland specimens from Rhyl of *Helix virgata*, large in size, approaching the var. *major*, and in coloration making an approach to var. *albicans*.

Ancylus lacustris a Thread-spinner.—My valued correspondent, Mr. T. D. A. Cockerell, has communicated to me the interesting circumstance that this species has the power possessed by many other of the Limnæidæ of spinning a mucus thread.—He says "I have just been watching a young specimen of *Ancylus lacustris* spinning a downward thread." According to the rough but characteristic sketch of the circumstance made by Mr. Cockerell, the thread was about half-an-inch long, attached to the extremity of a leaf of the *Anacharis*, the body of the animal being bent during the operation, the head and tail nearly close together.—J. W. TAYLOR, Aug. 15th, 1883.

Paludina vivipara v. **unicolor** *Jeff.*—Dr. Jeffreys, in 'British Conchology,' vol. i. p. 58, describes the bandless form of this species under the name of *Paludina vivipara* v. *unicolor*, characterizing it as "without bands," and in quoting the localities says: "The variety has been found by Mr. Pickering in Hertfordshire, and by myself in the Thames at Richmond."

Mr. Pickering, who appears to have first discovered this variety, and whose find is quoted as above by Dr. Jeffreys, fully described it in 1847 in the 'Zoologist,' p. 1786, and bestowed upon it the name "*efasciata*" in an article entitled "Description of a New Species or Variety of British Paludina." In that communication Mr. Pickering says "the shell is perfectly bandless, both externally and internally, in all stages of growth. It has 5½ volutions in the adult state: the colour is a bluish-green when alive with the animal in it, changing to yellowish-green after the animal has been removed and the moisture of the periostraca thoroughly dried up: inside light bluish-white, and the lip edged with dark-brown. The shell is very local and by no means plentiful. I have taken it in slow streams in Hertfordshire for the last three years successively, but nowhere else. I have never met with any specimens that are intermediate between it and the strongly banded ones, but

on the contrary all the other specimens I have taken associated with it are the most strongly banded I have ever seen. As this shell is so very distinct in appearance from the two described species of British Paludinæ...I propose, until decided whether it be a distinct species or not, naming it *Paludina achatina* [=*vivipara* of modern authors] v. *efasciata*." The name *efasciata* has thus priority and supersedes Jeffreys' name *unicolor*. This form will now stand as *Paludina vivipara* v. *efasciata* Pickering. —J. W. TAYLOR, Aug. 13th, 1883.

Variation in the coloration of Planorbis contortus Linn.—Collecting shells a few months ago (during June) in a small pond near the Black Hills, York Road, Leeds, I was astonished to see a small *Planorbis*, which proved to be *P. contortus* Linn., of a bright pink or scarlet color, and which was so conspicuous as to attract my attention as the animal was feeding on some plants at some distance in the pond. Having secured the specimen I found that the pink color of the shell was due to the color of the animal, which was of a bright scarlet or carmine.—W. NELSON, Aug. 1st., 1883.

Planorbis complanatus monst. **terebrum** Turton.—This singular form of *P. complanatus* is of a regular conical shape with very deep sutures. It is figured by Woodward in his "Manual of the Mollusca,"—from a specimen found near Rochdale—and also by Tate in his "British Land and Freshwater Shells," and was first described by Turton as *Helix terebra*, and afterwards by Brown as *Helix cochlea*. Mr. W. Jeffery, of Ratham, Chichester, has been so fortunate as to find a specimen in a pond in his neighbourhood which he has most generously sent to me alive for the collection of the Conchological Society. The specimen has the normal number of whorls and is about 5 mill. in diameter with an altitude of 7 mill. The animal does not appear to differ from the normal form.—J. W. TAYLOR, Sep. 6th, 1883.

THE DARTS OF BRITISH HELICIDÆ.

By CHARLES ASHFORD.

PART III.

[CORRECTION.—In pl. ii., fig. 1, the reference letter "*f*" has been, by error, placed near the duct of the spermatheca. It should be near the whip-like organ on the left. The explanation at the foot of the same plate does not clearly state that fig. 1 *only* has special reference to *H. hortensis*.]

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4. **Helix ericetorum** Müller, pl. v. figs. 1—5. DART-SACS two in number, each simple; lower parts fused to vagina, free ends ovate, bluntly pointed; greyish-yellow, speckled with minute brown dots. DARTS like simple tubes, curved, twisted; head sometimes compressed; base not expanded; annulus absent. Length 4 to 5½ mm.

This is the largest of our four species furnished with a pair of darts, and the only one having two simple dart-sacs (fig. 1). These sacs are liable to modifications. Sometimes they are of unequal length, and I once found one member of the pair very small—perhaps atrophied—the other being of usual size. But I never met with them so distinctly separated as represented by Martin Lister (Exer. Anat.), and by Ad. Schmidt. They are surmounted—rather high up—by a verticillate corona of slender, generally simple, sometimes bifid mucous glands, varying from 8 to 11 in number. In one case I counted nine, with a total of 18 branches. The papillary common outlet of the dart-sacs may frequently be distinguished through the investing coats with the points of the two weapons protruding from it.

The darts (fig. 2) are stout, sharply pointed, and large for the size of the animal. Only those of mature growth show a flattened head (fig. 3). The amount of compression varies, but the lateral edges do not develope into blades. Both Busch and

This and the last species have been put in sequence for the sake of contrast.

The curious broadly ovate dart-sac of *H. Pisana* has a prominent, medial, external ring suggesting the form of an acorn (fig. 9). From near the junction of the sac with the vagina spring the two immense, subclavate, simple mucous glands. These are of slightly irregular outline, white or tinged with buff, present a tumid, more or less soft spongy appearance, and are about 10 mm. in length. In Schmidt's figure (Stylomm. fig. 23) they are represented very much more slender than I have ever met with them in home specimens, and he describes them as "wormförmig." It would be interesting to know if a local difference of this kind is constant; but it is possible that the preparation, from which the figure referred to was drawn, —and which the eminent malacologist acknowledges was one that had been some time mounted,—had contracted in drying.

I have never met with either gland bifid or showing a tendency to cleavage. Moquin Tandon mentions one instance of the kind. The differentiation of the dart-sac appears to be first observable when the shell is between 6 and 8 mm. in breadth.

The dart of this species is very small for the size of the animal; it does not exceed in length that of *H. caperata*. The four symmetrically disposed blades are thin and translucent, presenting, under a quarter-inch objective, the appearance of a multitude of minute crystalline spicules. Their outer edges diverge into two well-formed flanges, inclined to one another at an angle of about 150°—160°, thus forming troughs or channels (figs. 10 and 11). Each compound blade disappears, not very gradually, before reaching the point, but ends quite abruptly and squarely at the base of the dart about half-way down the expanded part (fig. 16). Such is the complicated build of this beautiful little obelisk when perfectly formed. It is however, subject to many modifications of detail, though *these are never of* such a kind as to obscure the type or plan of

structure. In some cases the lateral edges below the point present concave, in others convex outlines. The distance from the point of the weapon at which the blades disappear is very variable, and the two pair of blades sometimes differ from each other in this respect. Occasionally the flanges, forming the channels already referred to, as they approach the point, dip below the sharp edge of the blade proper, leaving the latter standing out as a ridge in the centre of the channel. A transverse section below the point will then present the arrangement shown in fig. 15, which is rather diagrammatic than strictly accurate. In the basal region the outer line of the blades is sometimes straight, sometimes curved in accordance with the enlargement of the shaft. In short, it may almost be asserted that no two darts of *H. Pisana* are exactly alike, and yet they can never, for a moment be mistaken for those of any other British species.

Young darts have a narrow, almost cylindrical base; the annulus is unformed; the blades are not yet channelled, and their edges are more or less jagged (fig. 12). The last remark applies also to the imperfect flanges at a later stage.

Of 13 individuals, obligingly procured for me from Tenby by Mr. G. S. Tye, in the month of September, all yielded darts except one which had a shell manifestly not full-grown. Out of a batch obtained from Jersey at the beginning of July, ten adult shells yielded eight darts, two of which were immature.

The figures 10, 11, 16, are from Tenby specimens, the others from examples obtained from Jersey.

Helix aspersa Müller **in Tasmania.**—I have recently obtained some fine living examples of this species in a garden at Hobart, thus proving its thorough acclimatization in this island. It has been abundant about Melbourne, Victoria, for some years.—W. F. PETTERD, Nov., 1883.

allied to a fossil form from the Miocene beds at Aldinga Bay, S. A. Dedicated to my friend, Dr. Higgins, F.L.S.

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4. **Aclis micra** n. sp. Shell minute, subulate, thin, white, pellucid, shining ; whorls 6, rounded ; aperture ovate, somewhat small. Long. 1 mill., lat. ½ mill.

Habitat, North coasts and Isles in Bass's Straits.

A very small pellucid shell, often met with in shell sand.

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5. **Eulima vitrea** n. sp. Shell subulate, translucid, very highly polished, vitreous ; whorls 9, flattened, marginate at the suture, an indistinct band on last whorl ; aperture narrowly pyriform, very acute behind. Long. 3 mill., lat. 1 mill.

Habitat, Tamar Heads.

The coloration is rather variable, sometimes there are two indistinct bands, and one example is totally without coloration.

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6. **Chemnitzia Beddomei** n. sp. Shell elongately turreted, milky-white, opaque, shining ; whorls 8, rounded, with many rounded small ribs, interstices equalling ribs in width, ribs obsolete at base of last whorl ; aperture oval, labrum thin ; suture very much impressed. Long. 5 mill., lat. 1½ mill.

Habitat, North-west coast.

Much like a *Parthenia*, but without a tooth. Not by any means rare, but often in poor state of preservation.

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7. **Trophon laminata** n. sp. Shell ovately fusiform, reddish-chestnut, turreted, whorls 6, girded transversely with sub-raised ribs, longitudinally ornamented with waved scabrous liræ, which pass over the ribs and

almost conceal them; apical whorl smooth; aperture darker tint, ovate, outer lip thin; canal rather short. Long. 6 mill., lat. 3½ mill.

Habitat, Tamar Heads.

Of this very distinct form I have only seen four examples, we may therefore conclude that it is somewhat rare. In sculpture it is so very unlike any any other species that it can be easily identified. It may possibly attain a larger size than the measurements given above, but they are taken from the largest specimens in my collection.

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8. **Rissoa lineata** n. sp. Shell small, conical, turreted, whitish with several spiral chestnut-brown lines; whorls 4½, longitudinally ribbed, base with several transverse raised lines; aperture ovate. Long. 1½ mill., lat. 1 mill.

Habitat, North Coast, on the underside of exposed rocks at low-water.

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9. **Rissoa dubius** n. sp. Shell ovate, dark bluish-brown, smooth, shining, moderately thick; whorls 4½, spire short; aperture large, somewhat expanded, labrum white. Long. 2 mill., lat. 1 mill.

Habitat, Tamar Heads; collected on the rocks at low water.

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10. **Rissoa bicolor** n. sp. Shell ovately conical, smooth, shining, rich brown colour, with a broad sordidly white band next the suture; whorls 6, without sculpture, suture moderately impressed; aperture small, ovate, entire, thickened. Long 3½ mill., lat. 2 mill.

Habitat, North coast.

A very abundant form at low water, with the two preceding.

11. **Rissoa approxima** n. sp. Shell turbinately conoid, reddish-brown, smooth, very highly polished; whorls 4½, rounded, suture impressed, apex obtuse; aperture ovate, labrum thin; subumbilicate. Long 1¼ mill., lat. ¾ mill.

Habitat, Tamar Heads.

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12. **Rissoa badia** n. sp. Shell small, narrowly oblong, smooth; whorls 6; aperture small, labrum thick; apical whorls inflated. Long. 1¾ mill., lat ½ mill.

Habitat, North Coast, and Isles in Bass's Straits.

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13. **Rissoa Diemenensis** n. sp. Shell turbinately-conical, chocolate brown, dull; whorls 5½, convex, coarsely ribbed longitudinally, emarginate at the suture, which is of a paler tint than the rest of the shell; aperture almost circular, expanded, joined by a shining callous deposit. Long. 2 mill., lat. 1 mill.

Habitat, Table Cape and Tamar Heads.

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14. **Rissoa pulchella** n. sp. Shell minute, smooth, with faint lines of growth, brown, ovate; whorls 4½, suture fairly impressed; subumbilicate; aperture prominent, slanting, ovate, of moderate size. Long. 1 mill., lat. ¾ mill.

Habitat, North Coast and Isles in Bass's Straits.

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15. **Rissoa Layardi** n. sp. Shell small, turbinate, white, thin, subumbilicate, girded with raised spiral lines; whorls 5, rounded, suture impressed; aperture ovate; labrum thin. Long. 1½ mill., lat. 1 mill.

Habitat, North Coast.

Only a small number of specimens collected. May be separated by the fine spiral lines that are very *constant*.

16. **Schismope Beddomei** n. sp. Shell small, turbinately depressed, sordidly white, dull, thin; whorls 3½, apical flat, sinus conspicuous with raised margins; longitudinally plicate, plicæ more prominent at the base; aperture ovate, of moderate size. Long. 1 mill., lat. ¾ mill.

Habitat, North-west coast. Rarely met with in good condition.

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17. **Schismope pulchra** n. sp. Shell thin, white; whorls 4, last with two prominent keels at the periphery and several smaller at the base, longitudinally striate, striæ passing over the keels, giving them a nodose appearance. Long. 2 mill., lat. 1 mill.

Habitat, North-west coast (Miss Lodder).

In form not unlike *S. Atkinsonii* Tenison Woods, but very different in ornamentation. It was found in shell sand, and from its light texture is generally more or less broken. This is the fourth species of the genus described from our coasts.

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18. **Crossea minuta** n. sp. Shell minute, turbinate, smooth, white, shining; whorls 4½, rounded; umbilicus minute, aperture ovate, labrum somewhat thickened. Long. 1 mill., lat. ¾ mill.

Habitat, Long Bay, ten fathoms.

The smallest known form of the genus.

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19. **Cyclostrema micra** n. sp. Shell discoidal, shining, sordid white, marked with lines of growth; whorls 4½, rounded, suture impressed; base convex; umbilicus open; aperture circular, simple. Long. 1 mill., lat. ½ mill.

Habitat, North Coast and Isles in Bass's Straits.

A very minute species of no decided character, but quite distinct from our other forms of the genus.

20. **Obeliscus Tasmanica** n. sp. Shell cylindrical, white, pellucid, shining, with an obscure line on apical whorls; whorls 6, flattened, suture scarcely indented. Long. 8 mill., lat. 3½ mill.

Habitat, North West Coast.

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21. **Aclis turrita** n. sp. Shell subulate, turreted, thin, white; whorls 7, suture much impressed, last elongated; aperture small, pyriform. Long. 3 mill., lat. 1 mill.

Habitat, North Coast and Isles in Bass's Straits.

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22. **Stylifer robusta** n. sp. Shell tumidly pyramidal, opaque white, shining, spirally lined; whorls 9½, suture much impressed, rounded, last large, angled at middle; aperture pyriform; labrum thin, acute. Long. 13 mill., lat. 6 mill.

Habitat, Leven Heads (Miss Lodder).

This remarkably fine form is quite an acquisition to our Molluscan fauna. I have only seen one or two perfect specimens, but many in a more or less broken condition.

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23. **Stylifer Lodderæ** n. sp. Shell elongately pyramidal, thin, shining, milky-white; whorls 12-13, moderately rounded, marginate at suture with faint spiral lines, last sub-obtuse at periphery; aperture pyriform, labrum thin, acute. Long. 16 mill., lat. 6 mill.

Habitat, North West Coast (Miss Lodder).

Of this species I have seen a somewhat large number of examples. It varies a little in form, some specimens almost running into the preceding. It is never very highly polished, but invariably has a milky-white appearance; the same remarks also apply to *S. robusta.*

24. **Cyclostrema Harriettæ** n. sp. Shell discoidal, openly umbilicated, freely showing the whorls; whorls 4½, spire very little raised; white, with several slightly raised, rounded, spiral lines near the central portion of the body whorl; aperture rounded, diagonal, thin, acute. Long. 3½ mill., lat. 1½ mill.

Habitat, North West Coast.

A pure white species very closely allied to *C. Tatei* Angas, from South Australia, but quite specifically distinct.

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25. **Rissoina approxima** n. sp. Shell minute, turretedly elongate, sordidly white; whorls 7, flattened at the suture, numerous longitudinal rounded ribs, base smooth, aperture small, roundly ovate. Long. 2½ mill., lat. ¾ mill.

Habitat, North coast.

This pretty little species may be recognized by its very small size, and sculpture. It is not at all rare, but like many of the more minute forms often escapes notice.

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26. **Trophon tumida** n. sp. Shell tumidly ovate, subumbilicate, pink; whorls 5, obscurely bicarinate, longitudinally, conspicuously plicate, plicæ prominent, distant, angulate and sub-foliate, transversely regularly lirate, liræ rounded and crossed with fine longitudinal striæ; sutures impressed; aperture ovate, large, about the length of spire, chestnut, enamelled, outer lip thin, acute but thickened behind; umbilicus small but open, margined with imbricate scales almost the length of the canal, which is short and straight. Long. 12 mill., lat 8 mill.

Habitat, North-west coast (Miss Lodder).

A pretty tumid species, but rarely obtained. It comes nearer *Murex scalaris* A. Adams (the *Trophon umbilicatus* of Tenison Woods), than any other of our numerous forms of the genus, but may be distinguished by its swollen form, beautiful sculpture and colour. I have never collected any species like it in the south.

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27. **Trophon eburnea** n. sp. Shell fusiform, white, dull; whorls, 4½, rounded, suture impressed, irregularly marked with lines of growth, ornamented with very fine numerous spiral lines, interspaces decussate; aperture somewhat large, ovate, outer lip thin; canal short and open. Long. 16 mill., lat. 8 mill.

Habitat, Tamar Heads.

A plain milk-white, finely cancellated fusiform species, totally different from any other described from our coasts. It has much the aspect of a *Fusus*. Professor Tate obtained a single specimen at Aldinga Bay, South Australia.

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28. **Terebra Beddomei** n. sp. Shell elongate, white, smooth, apex blunt, suture scarcely impressed, whorls 6-7, very slightly convex. Long. 6½ mill., lat. 2 mill.

Habitat, Brown's River.

A plain form without ornamentation.

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29. **Cerithiopsis Johnstoni** n. sp. Shell elongate, turreted, white, somewhat translucent; whorls 14 (?), decollate, suture excavate, with spiral grooves on each whorl, grooves very finely transversely striate; aperture obliquely quadrate, slightly reflexed, narrowed anteriorly. Long. 9 mill., lat. 2½ mill.

Habitat, Circular Head, Tamar Heads, and other localities on the North Coast. Somewhat rare.

May be known from *C. crocea* Angas, by its altogether different sculpture and want of colour.

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30. **Volvaria lubrica** n.sp. Shell minute, ovately cylindrical, brownish, smooth, shining, translucent; whorls 3, rounded; aperture narrow, slightly increasing in width towards anterior margin, where there is a single fold forming its reflexed margin; outer lip simple; spire scarcely elevated. Long. 2 mill., lat. 1½ mill.

Habitat, Brown's River, dredged in about 6 fathoms.

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31. **Marginella mixta** n. sp. Shell small, elliptical, polished, yellowish-brown; whorls 4, spire but little elevated, apex obtuse; aperture long and narrow, columella with three plaits, outer lip somewhat thickened. Long. 7 mill., lat. 3 mill.

Habitat, Southern and Eastern coasts.

Somewhat plentiful in accumulated shell sand. Comes near *M. stanilas* Tenison Woods, but may be separated by its narrow elongated form and triplicate aperture.

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32. **Marginella Beddomei** n. sp. Shell small, ovate, rather thick, shining, white; spire rounded; aperture narrow, wider anteriorly, columella 3-plicate and dentate above, outer lip thickened and thickly dentate. Long. 3½ mill., lat. 2 mill.

Habitat, Southern coasts, with the preceding.

A small ovate species, with dentate aperture, It is not at all uncommon.

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33. **Marginella Johnstoni** n. sp. Shell thick, oblong, ovate, pale yellowish-white, with a thick white callous expansion over the front, polished; whorls 4½; spire

short, acute, nucleus smooth, suture emarginate; aperture narrowish, 4-plicate, lip white, rounded, thickened, and expanded. Long. 8 mill., lat. 5 mill.

Habitat, North and East coasts.

A very fine form, approaching *M. muscaria* and *M. tasmanica*, but easily known from either.

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34. **Marginella minima** n. sp. Shell minute, pyriform, white, polished; whorls 3, spire depressed, nucleus scarcely exserted, suture distinct; aperture narrow, rather wider toward the anterior margin, with ten plications which gradually increase in size, posterior margin somewhat raised and inflated to nearly the same level as apex. Long. 1½ mill., lat. ¾ mill.

Habitat, Dredged off Long Bay in about 7 fathoms.

A form so small may be easily overlooked, although somewhat abundant.

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35. **Eulima aurantia** n. sp. Shell subulately elongate, smooth, polished, rather thin, orange colour with a paler band below the suture; whorls 9, last with an indistinct paler band at the middle, suture distinct; apex white, blunt, and embryonal whorl twisted; aperture small, ovate, pointed behind; inner lip thinly reflected, outer acute. Long. 7 mill., lat. 1¾ mill.

Habitat, North Coast.

I have obtained several examples of this very neat and distinct species. Its narrow elongated form and peculiar coloration separates it from the rest of our somewhat numerous representatives of the genus. It is about the same size as *Turbonilla fusca* Angas (the *Elusa bifasciata* of Tenison Woods); in coloration it is also not unlike that species. I have seen some few almost white specimens, but there is generally some trace of the characteristic coloration.

36. **Clementia Tasmanica** n. sp. Shell very thin, transversely ovate, inequilateral, equivalve, yellowish-brown, sub-pellucid; outer surface with irregular concentric lines of growth crossed by fine radiating wavy striæ; interior margin not dentate, pinkish white. Long. 11 mill., lat. 15 mill.

Habitat, Dredged off Long Bay and Brown's River in about 7 fathoms.

A very fragile bivalve, but rarely obtained.

Myochama Woodsii n. sp. Shell thin, very irregular, somewhat foliaceous, yellowish white; umbones very distinct, trigonal, concentrically ridged, ridges raised and rounded, interspaces reticulate; interior shining, nacreous. Long. 10 mill., lat. 10 mill.

Habitat, D'Entrecastreaux Channel, dredged in about 7 fathoms, parasitic on *Pecten laticostatus* and *P. asperrimus*.

Fully developed examples are but rarely obtained. I have only seen it attached to the shells mentioned.

Valvata piscinalis monst. **sinistrorsum in Derbyshire.**—I am indebted to Mr. Edgar Pickard, of Mansfield, for the loan of a very interesting collection of our land and freshwater shells, mainly illustrating the fauna of Derbyshire. Amongst the shells are several more or less scalariform specimens of *Valvata piscinalis* collected at Cresswell Crags in Derbyshire. Two of these are sinistral, one appears to be adult, the second is only half-grown. The only other specimen on record that I know of, is that noticed by Dr. Jeffreys, as found by Mr. Grove at Sunbury.—J. W. Taylor, Dec., 1883.

New variety of Arion ater.—On the 6th of August of this year Mr. W. Eagle Clarke, who was walking with me from Otley to Pool, picked up on the high road near the latter place a fine full-grown specimen which in colouration does not agree with any of the varieties described by Moquin-Tandon, and which I therefore propose to call

Arion ater var. **plumbea** var. nov.,

and which may be characterized as follows:—Animal uniform lead colour, paler towards the foot; margin of foot dull yellow. This new variety approaches more nearly to Moquin-Tandon's var. *nigrescens* than to any other. It is described as being uniformly blackish, a colour which does not apply to my specimen, and I cannot find that the lead coloured specimens have been named. I am indebted to Mr. Clarke for the suggestion of the name as well as for the specimen.—W. D. ROEBUCK, Aug. 29th, 1883.

Limnæa palustris monst. **carinatum** n. m. (Pl. i., fig. 6). Shell with a very strong keel, spire slender and pointed. Length 11 mill., breadth 7 mill.; apert. length 5 mill., breadth 5 mill.

This very peculiar shell has been found by Mr. S. C. Cockerell, of Chislehurst, in a pond near Bromley, with the type and *L. peregra*. The pond is almost dried up in the summer time, and there appears to be no water plant in it, but plenty of grass.

The specimen is finely obliquely striated, and appears of a very dark brown colour from the incrustation with which it is covered. The first 3 whorls appear normal, being somewhat convex as usual, but afterwards a tendency to compression is noticed, which greatly intensifies, until in the last whorl formed it appears almost hollowed just before its expansion to the keel.—JOHN W. TAYLOR, Sep. 21st, 1883.

MARINE MOLLUSCA COLLECTED AT ILFRACOMBE.

By J. W. CUNDALL.

[Read before the Conchological Society.]

Although the following list of Marine Shells, taken at Ilfracombe and in its immediate vicinity, embraces the results of visits made in numerous years, it does not pretend to be exhaustive, and as several species were only included this season, the probability of its still being incomplete is evident.

Anomia ephippium. Common.
Arca lactea.
Arca tetragona. Odd valves much worn at Barricane Bay.
Artemis exoleta. Dead Shells at Barricane Bay.
Buccinum undatum.
Chiton cinereus. Lee Bay, &c.
Chiton fascicularis. Very abundant.
Cerithium reticulatum. Dead Shells at Barricane Bay, &c.
Cardium echinatum. Ditto.
Cardium edule. Ditto.
Cardium Norvegica. Ditto.
Cardium rusticum. Ditto.
Crenella discors.
Crenella marmorata.
Ceratisolen legumen. Abundant at Saunton.
Cylichna cylindracea. Dead Shells at Barricane Bay, &c.
Cypræa Europæa. Ditto.
Dentalium tarentinum. Ditto.
Emarginula reticulata. Ditto.
Erato lævis. Ditto.
Eulima polita. Ditto.
Fissurella reticulata. Ditto.
Kellia suborbicularis.

Lacuna crassior.
Littorina rudis.
Littorina rudis var. **nigro-lineata.**
Littorina rudis var. **tenebrosa.**
Littorina littoralis.
Littorina littoralis var. **fabalis.**
Littorina littorea.
Lasea rubra.
Mactra solida. Abundant at Saunton and Woollacombe.
Mactra stultorum. Ditto.
Modiola barbata.
Modiola tulipa. One odd valve.
Murex erinaceus.
Mytilus edulis.
Nassa reticulata.
Nassa incrassata.
Natica nitida.
Natica monilifera.
Nucula nucleus.
Ostrea edulis.
Pleurotoma rufa. Dead Shells at Barricane Bay.
Pleurotoma costata. Ditto.
Patella vulgata.
Patella athletica.
Patella pellucida.
Patella pellucida var. **lævis.**
Pecten pusio.
Pecten varius.
Pecten opercularis.
Pholas dactylus. Odd valves at Barricane, &c.
Purpura lapillus.
Rissoa cingillus.
Skenea planorbis.
Saxicava rugosa.
Scalaria communis.

Syndosmia alba.
Solen siliqua. Fragments only.
Tapes decussata.
Tapes pullastra.
Tellina solidula.
Tellina tenuis.
Tellina fabula.
Thracia convexa. One specimen only. Barricane Bay.
Thracia phaseolina. Woollacombe.
Trochus ziziphinus. Watermouth.
Trochus cinereus.
Trochus lineatus.
Trochus umbilicatus.
Turritella communis. Very young. Barricane Bay.
Teredo megotara.
Venus striata.
Venus fasciata.
Venus ovata.

Limnæa stagnalis var. **fragilis-variegata at Malham Tarn.**—On the 1st of September, Mr. J. D. Butterell and I explored—by the aid of a boat, kindly placed at our disposal by the High Sheriff of Yorkshire (Walter Morrison, Esq.), on whose property the Tarn is—the molluscan fauna of Malham Tarn, which is situated on an elevated moorland plateau, 1250 feet above the sea level. As nothing had ever been recorded, we were pleased at finding a rather unexpectedly rich fauna, but as our exploration was incomplete and will be resumed at an early opportunity, I will now only say that we found *Limnæa stagnalis* very abundant upon *Potamogeton lucens* near the N.E. shore of the Tarn. The specimens were all of the *fragilis* form, rather small and very graceful in contour, and had the whorls (except the final one) variegated with opaque white markings at somewhat regular intervals. They thus differ from the Folkestone specimens of *variegata*, collected by Mrs. Fitzgerald, which have the white markings only on the last or body whorl. —Wm. Denison Roebuck, Sep. 21st, 1883.

Gundlachia in Tasmania.—It may interest many of your readers to know that a second species of this very interesting and curious genus has been discovered in an obscure stream in the southern part of the island. It is larger than *G. Petterdi*, and differs also in form and colour. Can any of your readers supply information respecting the West Indian and Central American forms? I am sure any information would be generally interesting. I do not think there are more than five or six known species of the genus. Can you give a list of the species with habitats?—W. F. PETTERD, Nov., 1883.

Limax maximus var. **maculata** Picard **in Britain.**—We should now add this variety to the British list, a specimen sent me from Christchurch, South Hants., by Mr. C. Ashford, to whose kindness I have so often been indebted for specimens of slugs, agreeing fairly well with Moquin-Tandon's description, which I translate thus:—"Animal ash-coloured, shield and back with irregular black spots." The specimen referred to has the shield well spotted, but there are not very many on the back, and none at all on the sides. This variety may be expected to occur in other British localities, while in France it has been noted in the department of the Somme by Picard (teste Moquin Tandon), and Lessona and Pollonera in their recently published Monographia dei Limacidi Italiani, make its range include the whole of Italy and the Island of Sardinia. Mr. Ashford gives the following interesting notes on the specimen which he sent me:—"The two *L. maximus* differ in shade and markings. These two were taken in the act of copulation, hanging from a brick wall in the garden, about four feet from the ground. A large triangular film of slime formed the base of attachment, continued as a rather thick cord 5½ inches long nearly clear of the wall. By this cord the animals hung by their tails, coiled in the usual orthodox manner, while an enormous mass of 'works' protruded below and was in constant motion. The mucous thread was so strong that it broke with a decided snap when the animals were removed into the *box.*"—*W.* DENISON ROEBUCK, Sep. 22nd, 1883.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting,

HELD OCTOBER 4TH, 1883.

Mr. J. W. Taylor presided. Minutes of the previous Meeting were read and approved.

SPECIMENS EXHIBITED.

The Chairman showed specimens from Mr. C. Ashford, including the following:—*Helix aspersa* monst. *sinistrorsum* from Christchurch; var. *albofasciata* from Carisbrook Castle; var. *exalbida* from Dorking; var. *grisea* from Torquay; a white specimen of *Helix rufescens* with depressed spire measuring 10 × 4 mm. from Ventnor; a specimen of *H. virgata* with spire produced, measuring 10 × 10 mm. from Earith, Hunts.; a large example of *Zonites cellarius* from Christchurch measuring 10 × 5 mm.; also var. *albida* of the same species from the same locality; a singularly deformed example of *Succinea elegans* from the River Lea, at Tottenham, Middlesex; and *Ancylus lacustris* var. *albida*, from the River Stour, at Christchurch. Mr. Taylor also showed a series of the darts of British Helices prepared by Mr. Ashford in illustration of the very valuable papers by him on the subject which are appearing in the *Journal of Conchology*. He also exhibited a collection of Land and Freshwater shells from Laugharne, in Carmarthenshire, sent by Mr. C. Jeffery.

On behalf of Mr. Edward Collier were shown *Helix Carthaginiensis*, found alive on the moor at Cardiff, by Mr. F. Wotton, along with a few dead shells of the same species; and *H. lactea* (also shown), evidently introduced with ballast, as Mr. Collier thinks *Helix villosa* was.

Mr. W. D. Roebuck exhibited specimens of *Testacella Maugei* var. *viridans* from the County of Waterford, Ireland, sent together with an almost complete set of the slugs of the same district, by Mr. J. H. Salter, of Newtown, in that county.

This species would appear to be an addition to the fauna of Ireland, and is referable to the variety which Gassies and Fischer (Monog. du genre Testacelle, 1856) say is the prevalent one in Portugal. Amongst the other slugs which Mr. Salter sent, the most remarkable is the var. *bicolor* of *Arion ater*, which is also an addition to the British List.

Meeting,

HELD OCTOBER 24TH, 1883.

The President, Dr. Evans, in the Chair. Minutes of previous Meeting were confirmed. Correspondence was laid before the Meeting from the Linnean Society, New South Wales, and Messrs. W. Coates, W. Cash, H. G. Fordham, E. Collier, B. Hudson, J. W. Davis, J. Ollard, and the President, Dr. Evans. The following

DONATIONS

were announced :—

"Proceedings of the Linnean Society of New South Wales," vol. viii., parts 1 and 2; "Abstract of the Proceedings of the Linnean Society, New South Wales," August, 1883.

NEW MEMBER.

Mr. Baker Hudson, Waterloo Road, Middlesbrough, was nominated for membership.

SPECIMENS EXHIBITED.

Mr. J. W. Taylor exhibited micro-photographs of the dentition of *Testacella haliotidea* var. *scutulum* taken by Mr. Thornton, of Leeds; also showed very large specimens of *Planorbis corneus* and *Limnæa stagnalis* collected by Mr. W. E. Clarke, in Croatia, during the present year; also *Paludina Hungarica*, a new species recently described by Mr. Hazay, from Buda-Pesth.

Mr. W. D. Roebuck showed a living specimen of *Limax cinereo-niger* (Wolf) found by Mr. W. West, at Shipley Glen, near Bradford.

Mr. Edward Collier exhibited *Helix hortensis* var. *arenicola* 12345 and (12)345; *H. nemoralis* vars. *albolabiata*, *hyalozonata*, *libellula* 00345; *H. ericetorum* and var. *alba*, and the vars. *alba* and *albicans* of *H. virgata*, all from Morcott, Rutlandshire; *Helix virgata* var. *alba*, from Cardiff; *Sphærium rivicola* from the Peak Forest Canal, Woodley, Cheshire; *Pisidium amnicum* from the canal at Apethorne, Cheshire; *P. amnicum* var. *flavescens;* and *Sphærium corneum* var. *scaldiana* from the Canal at Congleton, Cheshire; *Clausilia rugosa* var. *tumidula* from Uffington, near Stamford; *Physa fontinalis* from Moss Side, near Manchester; *Helix aspersa* var. *undulata*, Llandudno; vars. *grisea*, *exalbida*, *zonata*, *&c.*, from Worthing, West Sussex; *H. nemoralis* var. *rubella* 00300 measuring 25 mm. diam. × 19 mm. alt., from Seaton, South Devon; *H. rotundata*, *Zonites cellarius*, *Z. alliarius*, and var. *viridula*, all from the Nunnery Grounds, Isle of Man.

Meeting,

HELD AT BRADFORD, NOVEMBER 29TH, 1883.

The President, W. Hill Evans, Esq., M.D., presided. Minutes of previous Meeting were confirmed. Correspondence was laid before the Meeting from Messrs. G. S. Tye, F. Hepburn, B.A., J. A. Ollard, W. Jeffery, J. W. Cundall, and the Linnean Society of New South Wales.

DONATIONS.

were announced as under:—

"Abstract of the Proceedings of the Linnean Society, New South Wales," September, 1883; "Annual Report of the Trustees of the Smithsonian Institute, U.S.A.;" Six specimens of *Helix hortensis* var. *fusco-labiata* from Ratham, by Mr. W. Jeffery.

NEW MEMBER.

Mr. Baker Hudson was elected a Member of this Society.

Mr. W. West, of Bradford, was nominated for membership.

PAPERS READ.

A List of the Marine shells of Ilfracombe, by Mr. J. W. Cundall.

The President gave an Address on "Personal Reminiscences in Conchology," in which he spoke of the friendships made with other collectors since he began the study of Conchology, and the pleasures of collecting. Under this head Dr. Evans made some instructive and interesting remarks on his first finding *Limnæa involuta* and *L. Burnetti.*

SPECIMENS EXHIBITED.

The President showed a varied collection of Marine and Freshwater shells, including a series of *Achatinæ*, and *Bulimi* from S. America, and fine examples of *Unio Margaritifera*, Clodragh River; and *Anodonta cygnea*, Cratloe, County Clare; also *Limnæa palustris* from Limerick; *Paludina vivipara*, Stoke-on-Trent; *Helix fusca*, Coulton; *Limnæa solida*, St. Lawrence, Quebec; *L. gracilis*, New York; *L. stagnalis* = *jugularis* Ohio.

Meeting,

HELD DECEMBER 27TH, 1883.

Mr. J. W. Taylor in the Chair. Minutes of previous Meeting were confirmed.

NEW MEMBERS.

Mr. W. West, Bradford, was elected a member of this Society.

Mr. Wm. E. Clarke, F.L.S., Leeds, and Mr. George Roberts, Lofthouse, near Wakefield, were nominated for membership.

PAPERS READ.

Descriptions of New Species of Marine Shells of Tasmania, by Mr. W. F. Petterd, was communicated by the Chairman.

A List of the Mollusca of Mid-West Yorkshire, prepared from the Society's Record Book, by the Recorder, as Authorised by the last Annual Meeting, was accepted.

The Annual Report was next presented by the Secretary, and adopted.

The Report of the Recorder, Mr. W. D. Roebuck, was also adopted.

The Accounts for the year, as brought forward by the Treasurer, were considered and adopted. The Balance showed Income £8 6s. 4½d., Expenses £6 3s. 7½d., Balances £2 2s. 9d., Arrears £6 15s.

The Treasurer called attention to the large amount owing to the Society in unpaid Subscriptions, and asked that Members would be a little more prompt in this matter, and thus enable the Society to meet its requirements as they arose.

The Election of Officers was then proceeded with—the following being elected:—

President—Mr. G. H. Parke, F.L.S., F.G.S.

Vice-Presidents—Mr. Wm. Jeffery; Rev. Hy. Milnes, M.A.

Treasurer and Secretary—Mr. Thos. W. Bell, 10, Reuben Place, Leeds.

Recorder—Mr. Wm. Denison Roebuck.

Committee—Dr. W. H. Evans, Messrs. Edward Collier, F. Hepburn, B.A., J. W. Taylor, Wm. Nelson, and J. A. Ollard.

ANNUAL REPORT
OF THE
CONCHOLOGICAL SOCIETY of GREAT BRITAIN and IRELAND,
1883.

In presenting this account of their stewardship, the Committee are pleased to Report that the past year has been one of steady progression. There has been a gratifying accession of Members; and your Committee believe that as the influence of the Society extends, the number of its Members will be proportionately increased.

Original communications have been made during the year by Dr. Kobelt, and Messrs. W. Nelson, J. W. Taylor, J. D. Butterell, and J. W. Cundall.

Large numbers of specimens have been shown by the President (Dr. W. H. Evans), Messrs. J. W. Cundall, J. W. Taylor, W. D. Roebuck, W. Nelson, and other collectors, many of which have been exceedingly fine specimens and very rare. Records of all British species have been entered in the Society's books.

Copies of the Proceedings of the Linnean Society of New South Wales; Transactions of the Yorkshire Naturalists' Union; The Scientific Roll; Report of the Wagner Free Institute of Science, U.S.A.; Report of the Smithsonian Institution, U.S.A.; Report of the Local Scientific Societies Committee of the British Association; Report of the Third Conference of Delegates from Scientific Societies, held at Southampton, August, 1882; have been added to the Society's Library.

The Society is indebted to Mr. Wm. Jeffery for specimens of *Helix hortensis* var. *fusco-labiata*, and *Planorbis complanatus* monst. *terebrum*, presented to the Society's Collection.

The Recorder of the Conchological Society has to report that during the twelve months just expired more records have been made and verified than had been done in the whole of the six years previous. During those six years (ending December 31st, 1882) the total number of records made was 2,671, equivalent to an average of 445 per annum. But during the single year just expired, no less than 2,965 records have been made, each of which has been carefully verified by the Society's referees. This brings up to 5,636 the grand total of records which have been authenticated since the record-system was instituted. For this gratifying result, the Society and its referees are indebted to various Conchologists who have assisted most liberally by forwarding specimens, and in several instances, their whole collections, for inspection. In this way the faunas of the counties of Hants, East Sussex, Kent, North Essex, Hertford,

Middlesex, Oxford, Buckingham, Gloucester, Hereford, Worcester, Warwick, Stafford, Carmarthen, Carnarvon, Denbigh, Flint, Anglesey, North Lincoln, Cheshire, Lancashire, Berwick, Sutherland, Caithness, and Waterford, have been illustrated by extensive consignments of specimens from correspondents.

During the year the record-system has been extended to foreign countries, in so far as concerns the exotic range of British species and their allies. As yet however only 107 records of this kind have been made.

Taking the Yorkshire records for the purpose of comparison with the statistics given in previous reports, it may be observed that 821 records have been made, as against 830 in 1882, and 200 in the previous year, and that the total number of records now on the books for the five divisions of that county amounts to 2,957.

It is thus evident that during the year considerable progress has been made in the direction of the accumulation of a mass of detailed and authenticated information as to the distribution of the British Land and Fresh-water Mollusca.

The Recorder has now to thank the correspondents by whose help the work has been accomplished, and to ask that attention be more particularly paid now to the "neglected counties." To facilitate this object and enable correspondents to judge in what directions their assistance will be most useful, he has prepared (for immediate publication in the Journal of Conchology) a detailed memorandum giving a list of the counties and vice-counties into which for this purpose the British Isles have been divided, defining these areas where they are not perfectly identical with political counties, and stating the numerical extent to which the molluscan fauna of each has been verified. But it may be here remarked—as showing what great blanks exist in our information,—that from 8 counties in England, 4 in Wales, 32 in Scotland, and 28 in Ireland, no specimens whatever have as yet been seen by our referees, and to these it will be as well to direct special attention.

Occurrence of Cyclostoma elegans var. **fasciata** Picard **in England.**—Mr. C. T. Musson, of Nottingham, has kindly placed the whole of his fine collection of British land and freshwater shells in my hands for examination, and in looking over it I observed several specimens of the above variety amongst some *Cyclostoma elegans* from Chatham in Kent, and Tintern, Monmouthshire. This variety was noticed and figured by Gualtieri, and afterwards by Draparnaud, who distinguished it as var. γ and characterised it as *Cinerea fasciis duabus fuscis, iuterruptis.* Picard, in 1840 ("Moll. Somm. in Bull. Soc. Lin. Nord," I. p. 258) would seem to have been the first to bestow a definite name upon it. This variety is described by Moquin-Tandon as "Shell ash-coloured, with two interrupted brown or violet bands." We have thus another variety added to our native fauna, and from two widely separated localities.—J. W. TAYLOR.

Limax maximus var. **Johnstoni** Moq. **in East Gloucestershire.**—Among some very interesting slugs sent me last October by Mr. E. J. Elliott, of Stroud, was one of much interest which he found in East Gloucestershire near that town. In its markings it was a characteristic specimen of the variety *Johnstoni*, which has the shield spotted with black and the back marked with points and with two fasciæ of the same colour. But in its ground colour it differed most completely. There was no trace whatever of the usual ash colour of the species, but the animal, which was about two-thirds grown, was entirely of a delicately clear and translucent lilac or lavender tint, and so strikingly different in this respect that I venture for the present to call it *Limax maximus* var. *Johnstoni* Moq., sub-var. *lilacina* mihi. Mr. Elliott sent me many other interesting specimens which I shall notice in print on another occasion. —W. DENISON ROEBUCK, Dec. 1884.

NEW SPECIES OF FRESH-WATER SHELLS FROM AUSTRALIA.

By W. F. PETTERD.

[Read before the Conchological Society]

1. **Bithynia Richmondiana** n. sp. Shell cylindrically elliptical, sub-umbilicate, pale greenish, horny, thin, shining; spire roundly obtuse; whorls 4½, very convex, suture much impressed; aperture ovate, distinct from whorl, entire; operculum yellowish, horny. Length 3 mill., breadth 1¼ mill.

Habitat, creeks running into the Richmond river, New South Wales.

Occurs in some abundance on stones and plants in somewhat swift running streams. Its form and colour distinguish it from any other described Australian species known to me.

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2. **Amnicola positura** n. sp. Shell globosely conical, sub-umbilicate, sharply carinate, above conically acute, lower surface convex; colour almost black, often coated with *Diatomaceæ*; whorls 5½, suture marginate and impressed; aperture pyriform, almost entire, outer lip expanded. Length 3 mill., breadth 1¼ mill.

Habitat, Richmond River, New South Wales.

I collected a considerable number near Lismore, on the above river. It is very plentiful, but seems to be a local species. It may be known by the acute carination, robust form, and dark coloration.

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3. **Aynclus assimilis** n. sp. Shell small, broadly ovate, dark horny brown, dull, striate; apex twisted; aperture dark brown within. Length 3 mill., breadth, 2 mill., height 1½ mill.

This form comes so near *A. tasmanica* Tenison Woods, that it may prove to be identical. It appears to be broader with the apex more twisted.

The following is a list of the species of fresh-water shells I collected at the Richmond River:—

1. **Physa fusiformis** N. & T.
2. „ sp. ?
3. **Ancylus assimilis** mihi.
4. „ sp. ? A much longer, narrow form, very thin and pale colour. Pending the examination of additional examples I have provisionally named it *A. oblonga* n. sp.
5. **Planorbis** sp. ?
6. „ sp. ? Both very small representatives of the genus.
7. **Melania Tatei** Brazier.
8. **Bithynia Richmondiana** mihi.
9. **Amnicola positura** mihi.
10. **Sphærium** sp. ?
11. **Corbicula** sp. ?
12. **Unio** sp. ?

Colonizing Land Shells in East Sutherlandshire.—I have introduced colonies of the following shells into the lower part of the basin of the Brora river, after satisfying myself that none of them existed in a living state in the parish of Clyne, Sutherlandshire:—*Bulimus acutus* from Llandudno; *Helix virgata* from Llandudno; *H. ericetorum* from North Sutherland; *H. aspersa* from Banff. The three first are still living and likely to hold their ground, but I have lost sight of *H. aspersa*, probably killed out by Blackbirds.—W. BAILLIE, Oct. 24th, 1883.

SUBFOSSIL SHELL DEPOSITS IN NOTTINGHAMSHIRE.

By C. T. MUSSON.

[Amongst various interesting memoranda on Nottinghamshire conchology which Mr. Musson has sent for use in the preparation of the new monograph are some which are worthy of immediate publication. We now give the notes on the subfossil deposits of Bingham, Gotham, and Scarthingmoor; and Mr. Musson having sent no specimens of the deposits and their included species, we mark by means of an asterisk such of the latter as we have ourselves seen.—Ed.]

On Bingham Moor the moles have turned up numerous heaps of a black soil containing great quantities of shells, principally land species. On sifting some, I found the following forms :—

*Bythinia tentaculata
*Planorbis spirorbis
*P. vortex
*P. complanatus
*Limnæa peregra var. ovata
L. stagnalis
*L. truncatula
*Succinea putris
*S. elegans
*Zonites nitidulus
Z. crystallinus
*Helix nemoralis (vars. libellula 00300 and 00000)
Helix concinna
*H. hispida
H. rotundata
*H. pulchella
Pupa umbilicata
*P. marginata
*Vertigo antivertigo
*V. pygmæa
V. edentula
*Clausilia rugosa
*Cochlicopa lubrica
*Carychium minimum

This earth appears to be about three to four feet thick, and rests upon Keuper clay. It occupies a hollow in the hills N. and N.W. of Bingham, covering a considerable space. I traced the shells for a distance of about four hundred yards to the edge of the deposit, which is—roughly speaking—about half a mile broad by about a mile and a half long, and I believe

it extends further. It is now mapped by the Ordnance Survey as *alluvium*, and on the part now occupied by the fields where the above species came from, and called the moor, it was once boggy undrained land. It lies some fifty feet above the level of the Trent Valley, equal to about 130 feet above that of the sea.

At Gotham, on Gotham Moor, is a very similar deposit of black earth—not to be distinguished in any way from the Bingham deposit, and formed under similar conditions—resting in a hollow of the hills fully 170 or 180 feet above sea level, with an outlet in one direction only (the Fairholm Brook). Here I obtained the following species :—

* Planorbis spirorbis
* Limnæa truncatula
* Succinea putris
* S. elegans
Zonites cellarius
* Helix nemoralis (var. libellula 12345)
* Helix concinna
* H. hispida
H. pulchella
* Cochlicopa lubrica

The shells from the Fairholm Brook included :—

* Pisidium fontinale var. cinerea
* Bythinia tentaculata
* Limnæa peregra
* L. palustris
* Succinea elegans
* Zonites cellarius
* Z. nitidulus
* Helix concinna
* H. hispida
* H. caperata
* Clausilia rugosa

At Scarthingmoor near Tuxford Mr. W. Gain pointed out to me a very similar deposit of alluvium which appears to cover a considerable space of ground. In a field where an excavation had been made we found a section as follows :—

One foot of black soil full of shells, including

* Bythinia tentaculata
* Valvata piscinalis
* Planorbis vortex
Zonites fulvus
* Helix hispida
* H. pulchella

* P. spirorbis	Pupa umbilicata
* Limnæa peregra v. ovata	* P. marginata
* L. palustris	* Vertigo pygmæa, &c.
* L. truncatula	* Cochlicopa lubrica
* Succinea elegans	* Achatina acicula

Mr. Gain also found on a previous visit a single specimen of *Cyclostoma elegans*. This layer is succeeded by three or four feet of a Tufa exactly similar to the 'petrified moss' on sides of rocks at Lambley Dumble, &c., covering the sides of the dumble close to the water. This deposit is tolerably hard and compact and in it the stems of reeds and grass are most distinctly seen.

This succession Mr. Gain has also seen at Grassthorpe and near Egmanton. It appears to be the remains of what was once a long narrow strip of boggy land following the course of the stream from Egmanton down to nearly as far as the alluvial deposits in the Trent valley, but is above the level of the latter, and about three miles in length. At Grassthorpe Mr. Gain has found the following species :—

Sphærium corneum	Succinea elegans
Anodonta anatina	Zonites cellarius
(one valve)	Z. nitidus
Bythinia tentaculata	Z. fulvus
Planorbis spirorbis	Helix nemoralis
P. complanatus	H. concinna
Limnæa peregra	H. hispida
L. palustris	H. pulchella
L. truncatula	Cochlicopa lubrica

In each case given, the streams which have brought and deposited these alluvial tracts rise on Keuper clay ground.

THE DARTS OF BRITISH HELICIDÆ.

By CHARLES ASHFORD.

PART IV.

7. **Helix nemoralis** L., pl. vii. figs. 1—6. DART-SAC simple, subclavate; lavender-grey to livid blue when mature, inner coat dark-brown. DART straight, considerably and somewhat conically expanded at the base; furnished with four sharp-edged blades, of which two are more prominent than the others; annulus of 15 to 18 rods. Length 7 to 8 mm.

The colour of the mature dart-sac is some shade between light lavender or French-grey and dull bluish lead-colour, generally intensified at each extremity. This, however, is not the hue of either of the two principal coats. The thick outer envelope is greyish-white, pink or light purple; the inner coat dark-brown, sometimes approaching black, red, or violet. The general livid aspect must be considered due to a modification of one by the other. At an earlier stage the sac is white, and in that state contains no dart. Several adjacent organs, also white at first, gradually assume a reddish-brown colour as maturity is approached, and Paasch states, according to Busch, that the intensity of the prevailing tint is proportionate to the extent and emphasis of the fasciation of the shell, the animals of unicoloured shells exhibiting less development of pigment than others. This opinion has received no support from the more recent observations of conchologists.

The two mucous glands (fig. 1) spring from the vagina close to its junction with the dart-sac, each generally dividing rather low down into two or more branches. The total number of cœca—in both groups together—is usually 5 or 6, sometimes 4 or 7, more rarely so few as three, or so many as nine. I have found the most common arrangement to be as represented in fig. 1—two branches to one gland and three to the other. Each cœcum is slender and nearly cylindrical, white, or with a tinge of pink. It will be necessary to revert to these particulars when we *come to H. hortensis.*

The blades of the dart are more or less transparent. They originate rather high up above the basal expansion (fig. 4), increase gradually in prominence to about the middle of their extent, where they attain a maximum breadth, and diminish upwards about as gradually, disappearing a short distance from the sharp solid point of the weapon. Their outer margins are invariably sharp—never channelled. The difference in the amount of prominence of the two pair of blades, exceptionally observable in some other species, appears to be a tolerably constant characteristic of the dart of *H. nemoralis*. Between two consecutive blades the shaft is rarely quite smooth, the intervening space being usually interrupted by crescentic films, extending transversely from one blade to the next, variable in number and distance; they are moderately transparent, slightly iridescent in certain lights, and generally disappear by short exposure to a heated solution of caustic potash. They may be, as Schmidt suggests, disrupted portions of an investing membrane, and the ragged condition they sometimes present favours this view, but if so, why do they often assume a crescent-form? Among British Helices these curious septa occur only in the present species and in *H. aspersa*, and are chiefly confined to the more matured darts.

There may sometimes be noticed in this dart a very slight curvature of the shaft more particularly in the apical half. It is rather difficult to determine when this is natural and when accidental. Every one who has cut out the dart of *H. nemoralis* with the dissecting knife must have observed a limited amount of plasticity in the organ; on this account its ultimate straightness or curvature, when dried by exposure, may depend upon the way in which it is laid out by the manipulator. But allowing that the dart of this species is not invariably quite straight, there appear to be no grounds whatever for the statements of Sheppard and Neumann that a relation subsists between the condition of the dart in this respect and the distribution of bands upon the shell (cf. Gray's Turton's Manual, 1840, p. 134).

Many years ago Adolf Schmidt undertook a careful examination of series variously banded, with this subject specially in view, and found nothing to corroborate the statement referred to; indeed he scarcely admits that the dart of *H. nemoralis*, in a natural state, is ever otherwise than straight.

Fig. 6 represents the condition of an immature dart when about 3 mm. long. The base is cylindrical, the central part of the shaft simply angulated, the annulus not formed. At a later stage the four nascent blades make their appearance with their jagged edges and unsymmetrical outline. I have now before me a dart nearly 6 mm. long. The blades are nearly complete, but the short narrow base still shows no indication of the trumpet-shaped termination (fig. 5) characteristic of the mature weapon. That enlargement therefore, as well as the annulus, must be acquired during the last two millimetres of growth, in some instances at least.

I once met with what may be called a case of hernia of the sac, the dark inner sheath having burst through the end of the outer coat so as to protrude about 2 mm. The sac contained a dart about 7 mm. long, into the conical base of which the annulus had been forcibly driven so as to be nearly concealed from view.

Including only such as had fully-formed shells, I find that of the individuals examined between March and September 69 per cent. had darts, 21 per cent. had not formed their darts, and 10 per cent. appeared to have lost them.

I am indebted to Mr. J. W. Taylor for living examples from Scarborough. The figures are drawn from specimens obtained near Christchurch.

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8. **Helix hortensis** Müller, pl. vii., figs. 7—11. DART-SAC small, subclavate; leaden blue when mature. DART curved, moderately expanded at the base; furnished with four channel-edged blades; annulus of 14 to 16 rods. Length 4 mm.

Except in size the dart-sac of *H. hortensis* is much like that of *H. nemoralis*, and the remarks on the colour of the latter

apply in great measure to the former. In both cases the sac is free, that is, not fused to the vagina, and is a simple clavate or subclavate pouch.

Each of the two mucous glands divides into two branches, and each of these again into either two or three others, but the exceptions to this rule are very numerous. Examination of a large series suggests a tendency in this organ to depart from a system once purely binary, for instances of bifurcation twice repeated are still common. Fig. 7 represents in their natural size a pair of mucous glands thus disposed, while fig. 8 shows a single gland in which the ramification is much less regular, and the branches more numerous. In the arrangement most frequently occurring, there are four branches in one group and five in the other. Moquin-Tandon counted in one case a total of 13 branches. I have never met with more than 11 nor less than 5 in full-grown examples. Dr. Gray, in a short communication upon the subject to the Annals of Philosophy in 1825, describes the mucous glands of *H. nemoralis* as being "more lobed" than in *H. hortensis*. On an average the reverse is the case. They differ also in form. In *H. hortensis* the branches are not cylindrical as in *H. nemoralis*, but irregularly tumid, especially towards the extremities, and a somewhat medial stricture is often noticeable, the portion below it being coloured and the part above white. A monstrosity once came under my notice, caused by the fusion of about 12 mm. of the two gland-stalks into one thick stem bearing seven branches.

The dart is invariably curved. The four blades start quite abruptly a little above the expanded basal margin and therefrom converge gradually and gracefully towards the point, a little short of which they disappear. The greatest diameter is thus at the lowest part of the blades (fig. 9). Each blade-margin divides into two prominent flanges forming smooth obtusely-angular channels or troughs (fig. 10*a*). The spaces between the blades never exhibit the septa described under *H. nemoralis*.

Adolf Schmidt in 1849 first drew attention to the difference between the darts of this and the last species, and a more detailed description than here given will be found in the 'Mal. Blätt.' for that and the succeeding year. In some additional remarks in the same journal for 1853, he says: "The darts are so different that an ambiguous form between the two is inconceivable (undenkbar). I have dissected hundreds of both kinds and have thereby arrived at the full conviction that in their darts lies the specific difference which must determine each individual case in question."

To this may be added that the darts of *H. hortensis*, *inter se*, are remarkably uniform in character. They may be compared to plates in a dinner-service, differing in size and some minor particulars, but impossible to be confounded with those of another pattern. Doubtful cases then are to be determined by their darts. But what if the dart be not forthcoming? We must fall back upon the mucous glands. And, variable as these organs confessedly are, we may *in some cases* arrive at a reliable decision, if we regard their total aspect—the resultant, so to say, of their length, mode of ramification, number of branches, form, colour, and texture.

I received through the kindness of Mr. W. Jeffery of Chichester, a batch of very suspicious looking shells—large, yellow, bandless, dark-mouthed, with coloured inner lip. The darts proved them to be a variety of *H. hortensis*, and the mucous glands were in accord.

Shells with various shades of lip are rather common round Christchurch, and I have carefully examined about 150. Many of them could scarcely be called doubtful, even at first sight. Moreover they were taken from the *hortensis* colony where *H. nemoralis* in its typical form does not occur. I was not surprised therefore to find every case—where the test of dart-form was available—referable to the present species. The following tabular statement, arrived at from an average of fifty members of each kind, shows how far the mucous glands of the variety just

referred to (var. *hybrida* of authors) afforded indication of affinity to *hortensis* in regard to the two more variable items of length of gland and number of branches :—

H. NEMORALIS	length	16·4 mm.	total No. of branches		5·49
H. HORTENSIS	„	21	„	„	8·4
VARIETY	„	21·9	„	„	8·7

Immature darts are curved at a very early stage. Fig. 11 represents, much enlarged, one now lying before me, about 1·3 mm. in length. Its qualities are chiefly negative. The blades follow first, then the flanges at their margin, the base expands before the blade-channels are quite complete, lastly the annulus.

Of examples of *H. hortensis* with mature shells examined between March and September, 58 per cent. had the dart present, 31 per cent. had not formed a dart, and 11 per cent. gave evidence of having lost it. I have also found the sac equipped in February, November, and December.

The figures are from examples collected at Christchurch.

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9. **Helix fusca** Montagu, pl. vii., figs. 12—15. DART-SAC broadly oval, with a well-defined secondary lobe between it and the vagina ; pearly-white. DART long, narrow, curved and tapering ; furnished with four blunt-edged blades ; base very large, irregularly cup-shaped ; annulus ? Length about 2 mm.

The roundly ovate dart-sac is for a considerable part of its length attached to the vagina (fig. 12). Between the two, intervenes an accessory, empty sac or lobe, smaller than the dart-sac, but rising a little higher. There are 7 to 9 simple or bifid mucous glands, vermiform or irregularly tumid, whitish with a dash of azure, and 3 to 4 mm. in length (fig. 14).

The neat little subulate dart (fig. 13) occupies the principal or outer lobe (fig. 15). Its shaft is regularly curved, sharply pointed, enlarging gradually downwards for about three-fourths of its length, when it expands more rapidly but not abruptly into a long irregularly goblet-shaped, puckered base. The four

slightly salient blades rise gradually above the basal expansion and converge towards the point. Their outer margins are somewhat thickened. I have not detected an annulus.

Mr. W. Robinson kindly sent me a considerable number of living specimens from Scarborough, at the beginning of August, but the shells were scarcely mature, and their sacs without darts. Other examples obligingly forwarded by Mr. S. A. Stewart of Belfast, in the following September, were fully grown and yielded several darts.

The illustrations are from the Irish specimens.

Obituary.—R. M. Lloyd.

It is our painful duty to record the death of Mr. Richard Mosley Lloyd, at his residence, Spring Hill, Birmingham, on Saturday, February 16th, after a few days illness.

Mr. Lloyd will be remembered by conchologists as having added two new and well-marked varieties to the British molluscan fauna, viz., *Paludina vivipara* var. *atro-purpurea*, and *Planorbis glaber* var. *compressa*, as also by his contributions to various natural history publications. Of late he had given more attention to microscopic work.

All who knew him will lament the loss of a warm-hearted and honest man, kind, indulgent and forbearing, simple-minded, yet clever in much of this world's knowledge, never obtrusive, ever ready to do a kind action, not seeking reward.

The writer, to whom he was a constant companion for more than twenty years, mourns the loss of a true, gentle, and genuine friend, and his sorrowing family a tender guardian, whose care was always for the welfare and happiness of those he loved, and who never spared himself in doing that which he thought worthy of his hand.

For many years Mr. Lloyd was one of the engineers to the Water Department of Birmingham, an office he held at his death, and wherein his upright character made him much respected.—G. S. T., February 21st, 1884.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting

HELD JANUARY 31ST, 1884.

Mr. J. W. Taylor occupied the Chair. The correspondence for the month was brought before the Meeting.

NEW MEMBER.

Mr. W. Eagle Clarke, F.L.S., of Leeds, was elected a Member of the Society.

SPECIMENS EXHIBITED.

Mr. Baker Hudson sent for exhibition specimens of *Helix hortensis* var. *roseo-labiata* from Dunbar, Haddingtonshire; *H. nemoralis* found near Durham, associated with *H. hortensis* var. *roseo-labiata*; and *H. cantiana* from Billingham, on the Durham side of the Tees. Referring to this shell, Mr. Hudson writes :—" The place where it is found is about half a mile from the river, on somewhat marshy and sterile land. I think it probable that this shell was introduced with ballast into this district not less than 30 or 40 years ago, that is before the river was improved, and ships passing what is now Middlesbrough, on their upward journey to Stockton and Yarm, had to discharge their ballast near Billingham. It is very local, being principally found close to the Port Clarence line of railway, and is associated with *H. nemoralis* and *H. aspersa*. So far as I have been able to observe during the past two years it does not occur at any other point near here."

Examples of *Clausilia Rolphii*, collected at Up Park, West Sussex, by Mr. W. Jeffery, of Ratham, were also shewn.

On behalf of Mr. R. M. Christy were shown specimens of *Limnæa palustris*, *L. stagnalis*, and *Planorbis trivolvis* from Carbery, Manitoba; and *Physa hypnorum* var. *major* from Brandon.

A series of shells from Mr. Edgar Pickard, of Mansfield, were shown, which included *Sphærium corneum*, *S. lacustre*,

Vertigo substriata, *V. pusilla*, *V. angustior*, and *Limax agrestis* from Cresswell; *Vertigo Moulinsiana* from Markland Grips, and others from Crowhill, Mansfield.

NEW RULE.

Mr. Taylor gave notice that at the next meeting he would move a New Rule empowering members to append to their names the initials of the Society (M.C.S.).

Meeting

HELD FEBRUARY 28TH, 1884.

Mr. J. W. Taylor presiding. Correspondence received during the month was brought before the meeting.

NEW MEMBER.

Mr. Geo. Roberts was elected a Member of the Society.

NEW RULE.

Resolved that the following do become Rule VI. in the constitution of this Society, namely:—"That Members shall have the privilege of appending to their names the initial letters M.C.S. (Member of the Conchological Society)."

AMENDED RULE.

Resolved that the word "two" before Vice-Presidents, on line 2 of Rule VII. be struck out and the word "four" inserted.

ELECTION OF OFFICERS.

Dr. W. Hill Evans and Mr. J. W. Taylor were elected Vice-Presidents of the Society for the current year.

Messrs. W. Cash, F.G.S., and James W. Davis, F.L.S., were elected Members of the Committee for the current year.

PAPERS READ.

"On Recent Occurrences of *Testacella haliotidea* var. *scutulum* in England," by Mr. W. D. Roebuck. "Note on the occurrence of *Acme lineata* in North Somersetshire" by Mr. J. W. Cundall.

SPECIMENS EXHIBITED.

Specimens of *Testacella haliotidea* var. *scutulum* from Hemel Hempstead, Ratham, and Gateshead were shown by Mr. Taylor in illustration of the paper. Mr. Roebuck showed the valves of a *Chiton* from Mossel Bay, South Africa. For Mr. E. Pickard an example of *Valvata piscinalis* monst. *sinistrorsum* from Cresswell Crags, Derbyshire, was shown.

Meeting

HELD MARCH 27TH, 1884.

Mr. J. W. Taylor, Vice-President, in the Chair. Correspondence from several members was brought before the Meeting.

NEW MEMBERS.

Mr. James Madison, 62, Camp Hill, Birmingham; Mr. E. J. Elliott, Middle Street, Stroud; and Mrs. M. Skilton, Brentford, Middlesex, were nominated for membership.

SPECIMENS EXHIBITED.

The Chairman, on behalf of Mr. Musson of Nottingham, showed living specimens of some interesting mollusca which had been obtained from a greenhouse at Nottingham, where they had been first observed after an importation of Sphagnum moss from the vicinity of Plinlimmon. Also on behalf of Mr. F. R. Coles varieties of *Helix nemoralis* and *H. hortensis* were shown together with *H. concinna*, *H. rufescens*, *Zonites cellarius*, and *Clausilia rugosa* from Kirkcudbright.

Valvata piscinalis v. albina in England.—This variety, which I believe has not been previously noticed, has occurred amongst the typical form at Clumber Lake, Notts., where it was found by Mr. Musson, of Nottingham. They may be described as pure white. Miss F. M. Hele, of Bristol, kindly sent me some time ago several specimens of this species, which were very nearly white, that she had collected at Yatton in Somersetshire.—J. W. TAYLOR, March, 1884.

THE PRESENT STATE OF KNOWLEDGE OF THE DISTRIBUTION OF LAND AND FRESHWATER MOLLUSCA IN BRITAIN.

It will facilitate the preparation of the proposed new Monograph, and much assist conchologists and others who wish to co-operate in its production if a table be given—which is now done—showing the extent to which the projectors have had the opportunity so far (to Dec. 31st, 1883) of examining specimens from the various counties and vice-counties of the British Isles. The numbers given in the columns of the table show how many species have been seen of each of the groups of inland mollusca, and as the SLUGS will be the first group treated of in the Monograph, their numbers are given independently of those of the other land snails.

Advantage is also taken of this opportunity to explain once for all in what way the counties or vice-counties of the conchological record or distribution-scheme differ from the political counties. These differences consist essentially in the sub-division of the larger areas, together with a certain amount of rectification of boundaries by throwing the detached and isolated portions of counties into the counties by which they are enclosed or surrounded.

A careful examination of the above table will show conchologists (1) how very little has yet been examined with a view of recording detailed distribution, and therefore (2) how very easily each can help by submitting specimens from the district he resides in or has opportunities of visiting. In addition to these points, which every one will see for himself at a glance, it will be well to urge upon attention the importance of sending **Slugs First,** for as the Monograph is to be commenced with this group, *Testacella* leading the van, it will be well to complete as far as possible the geographical range of each species of this group. And more especially is it desirable to pay pointed attention to the importance of sending living specimens to Leeds for

examination, on account of the group having been very much neglected as compared with the shell-bearing species. (Parenthetically it may be remarked that slugs should be sent *alive* in *air-tight* tin boxes).

To illustrate the limited extent to which we know the distribution of slugs, it may be stated that so far the *Testacellæ* have only been reported from the following counties:—Isle of Wight; East Sussex; Hertford; Oxford; West Gloucester; Worcester; Cheshire; S.E. Yorkshire; and Durham—nine only. The common field-slug (*Limax agrestis*), which is *supposed* to be everywhere, has so far been sent from the following counties only:—South Hants.; West Kent; South Essex; Hertford; Middlesex; Bucks.; East and West Gloucester; Hereford; North Lincoln; Nottingham; Carnarvon; Denbigh; Flint; Anglesey; South Lancashire; all five divisions of Yorkshire; Berwickshire; and Waterford. This leaves a balance of 126 counties from which specimens of this animal would be gladly received. With every other species of slug, a similar state of things exists, and until they have had the opportunities of inspection which they desire, the projectors of the Monograph will spare no pains in endeavouring to obtain specimens.

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
0.	**Channel Isles**	—	6	—	6	10
1.	**Cornwall West** ... ... Divided from next by the highroad from Truro through St. Columb to the inland extremity of Padstow Creek.	—	4	2	6	11
2.	**Cornwall East**... ...	—	1	—	1	1
3.	**Devon South** ... ... Divided from North Devon by the watershed line: it commences at the Tamar, about midway between Tavistock and Launceston, passes over the ridge of Dartmoor, and joins the Western Canal at Tiverton.	—	3	—	3	5
4.	**Devon North**	—	1	—	1	

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
5.	**Somerset South**	—	—	—	—	—
	Divided from North Somerset by the River Parret from Bridgewater to Ilchester, the line thence curving round to the N. extremity of Dorsetshire.					
6.	**Somerset North** ...	—	19	10	29	126
7.	**Wiltshire North**	—	—	—	—	—
8.	**Wiltshire South** ...	—	—	—	—	—
	North and South Wiltshire are separated by the Kennett and Avon canal.					
9.	**Dorsetshire**	—	3	—	3	5
10.	**Isle of Wight**	—	8	—	8	31
11.	**Hants South**	8	16	13	37	47
	Divided from North Hants by the high roads running W. and E. to the borders of Wilts. and Sussex respectively, through Stockbridge and Petersfield.					
12.	**Hants North**	—	18	2	20	25
13.	**Sussex West**	—	40	17	57	87
	Divided from East Sussex by the high road from Brighton to Cuckfield, thence through Crawley to the Surrey border.					
14.	**Sussex East**	2	30	3	35	170
15.	**Kent East**...	1	24	16	41	107
	Divided from W. Kent by the Medway and its tributaries from its mouth nearly up to Staplehurst, thence the line is along the high road through Cranbrooke to the Sussex border near Hawkeshurst.					
16.	**Kent West**	2	7	13	22	27
17.	**Surrey**	2	17	—	19	36
18.	**Essex South**	—	3	—	3	4
	Divided from North Essex by the high road from Waltham and Epping to Chelmsford, thence along the river Blackwater to its mouth.					
19.	**Essex North**	—	17	12	29	150
20.	**Hertfordshire**	3	26	7	36	85

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
21.	**Middlesex**	2	6	13	21	40
22.	**Berkshire**	1	8	—	9	13
23.	**Oxfordshire**	1	25	—	26	83
24.	**Buckinghamshire** ...	4	9	14	27	27
25.	**Suffolk East** ... ... Divided from West Suffolk by the parallel of longitude 1° East from the meridian of Greenwich.	—	—	—	—	—
26.	**Suffolk West** ... ... The detached portion upon which Newmarket stands is included with Cambridgeshire.	—	—	1	1	1
27.	**Norfolk East** ... ... Divided from West Norfolk by the 1° East parallel of longitude.	—	—	1	1	1
28.	**Norfolk West**	—	—	—	—	—
29.	**Cambridgeshire** ... ... Includes the Newmarket detached portion of Suffolk.	—	14	12	26	37
30.	**Bedfordshire** ... ... Includes a detached portion of Huntingdonshire.	—	—	—	—	—
31.	**Huntingdonshire** ... ... The detached portion is included with Bedfordshire.	—	8	—	8	28
32.	**Northamptonshire** ...	3	27	18	48	131
33.	**Gloucestershire East** ... Separated from West Gloucestershire by the Thames and Severn canal, thence by the river Severn from the point of confluence of the canal up to Tewkesbury. Includes five detached portions of Worcestershire and one of Warwickshire.	5	11	1	17	30
34.	**Gloucestershire West** ...	7	21	6	34	70
35.	**Monmouthshire** ... ... A detached portion is included in Herefordshire.	—	—	—	—	—
36.	**Herefordshire** ... ... Includes detached portions of Monmouthshire and Worcestershire. Detached portions of Herefordshire are on the other hand included in Brecknockshire, Radnorshire, Shropshire, and Worcestershire.	1	10	—	11	16

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
37.	**Worcestershire** ... ... Includes detached portions of Herefordshire, Shropshire, Staffordshire, and Warwickshire. Detached portions of this county are on the other hand included with Gloucestershire, Herefordshire, and Staffordshire.	1	9	4	14	23
38.	**Warwickshire** ... ... Detached portions are included in Gloucestershire and Worcestershire.	1	7	16	24	37
39.	**Staffordshire** ... ... Includes a detached portion of Worcestershire, which in its turn includes an outlier of Staffordshire.	—	10	7	17	22
40.	**Shropshire** ... ... Includes an outlier of Herefordshire. A detached portion of Shropshire is included with Worcestershire.	—	—	—	—	—
41.	**Glamorganshire**	—	1	—	1	4
42.	**Brecknockshire** ... Includes a detached portion of Herefordshire.	—	—	—	—	—
43.	**Radnorshire** ... ... Includes a detached portion of Herefordshire.	—	—	—	—	—
44.	**Carmarthenshire** ...	—	16	6	22	52
45.	**Pembrokeshire**	—	4	—	4	20
46.	**Cardiganshire**	—	—	—	—	—
47.	**Montgomeryshire**	—	—	—	—	—
48.	**Merionethshire** ...	1	2	—	3	4
49.	**Carnarvonshire** ... ... The Llandudno peninsula and other portions of this county lying East of the river Conway are included with Denbighshire.	5	28	3	36	114
50.	**Denbighshire** ... ... Includes outliers of the county last named, also the detached portion of Flintshire.	5	27	3	35	231
51.	**Flintshire** ... ... The detached (or Overton) portion is included with Denbighshire.	4	20	—	24	32
52.	**Anglesey**	2	29	4	35	135

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
53.	**Lincolnshire South** ... — Divided from North Lincoln by the Witham from its mouth at Boston to Lincoln, thence by the Foss Dyke to the border of Nottinghamshire.	—	1	—	1	1
54.	**Lincolnshire North** ...	2	8	12	22	52
55.	**Leicester and Rutland** ... Includes a detached portion of Derbyshire.	—	4	—	4	9
56.	**Nottinghamshire**	—	—	3	3	3
57.	**Derbyshire** ... ... — A detached portion is included with Leicester and Rutland.	—	14	—	14	47
58.	**Cheshire**	1	9	4	14	17
59.	**Lancashire South** ... — The River Ribble separates this division from the next.	—	5	9	14	16
60.	**Lancashire West** ... ... — The Furness district of North Lancashire is included with Westmoreland.	—	10	9	19	35
61.	**Yorkshire South-East** ... This is the East Riding of Yorkshire.	5	28	30	63	261
62.	**Yorkshire North-East** ... Divided from N.W. Yorkshire by the Rivers Wiske and Swale.	6	34	25	65	299
63.	**Yorkshire South-West** Equivalent to the Southern division of the West Riding. Divided from Mid-West Yorkshire by the Leeds and Liverpool canal and by the river Aire below Leeds.	3	37	38	78	564
64.	**Yorkshire Mid-West** ... Equivalent to the Northern portion of the West Riding minus the Dent and Sedbergh district, which is included with N.W. Yorkshire.	8	51	37	96	1464
65.	**Yorkshire North-West** Equivalent to the Western half of the North Riding with the addition of the Dent and Sedbergh district of the West Riding.	4	36	21	61	369

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
66.	**Durham** ... ... The detached portions are included with Northumberland and Cheviotland.	—	5	2	7	11
67.	**Northumberland South** Includes a detached portion of Durham, and is separated from Cheviotland by the river Coquet and a line continued to Carter Fell from the Linn Bridge.	—	4	—	4	4
68.	**Cheviotland** ... ... Equivalent to North Northumberland plus a detached portion of Durham.	—	1	—	1	1
69.	**Westmoreland and Lake Lancashire**	—	19	1	20	35
70.	**Cumberland**	—	—	1	1	1
71.	**Isle of Man**	—	15	6	21	63
72.	**Dumfriesshire**	—	1	1	2	3
73.	**Kirkcudbrightshire** ...	—	—	—	—	—
74.	**Wigtonshire**	—	—	—	—	—
75.	**Ayrshire**	—	—	—	—	—
76.	**Renfrewshire**	—	1	2	3	3
77.	**Lanarkshire**	—	3	—	3	3
78.	**Peeblesshire**	—	—	—	—	—
79.	**Selkirkshire**	—	—	—	—	—
80.	**Roxburghshire**	—	—	—	—	—
81.	**Berwickshire**	4	4	4	12	15
82.	**Haddingtonshire**	—	—	—	—	—
83.	**Edinburghshire** ...	—	—	—	—	—
84.	**Linlithgowshire**	—	—	—	—	—
85.	**Fife and Kinross** ..	—	8	2	10	10
86.	**Stirlingshire** ... ... Includes the detached portion of Dumbartonshire.	—	—	—	—	—
87.	**Perth West & Clackmannan** Separated from Mid-Perth by the line of watershed which divides the tributaries of the Tay from those of the Forth.	—	—	—	—	—

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
88.	**Perth Mid** ... ... Separated from East Perth by the rivers Garry and Tay.	—	—	—	—	—
89.	**Perth East**	—	—	—	—	—
90.	**Forfarshire**	—	—	—	—	—
91.	**Kincardineshire** ...	—	—	—	—	—
92.	**Aberdeenshire South** ... Separated from N. Aberdeen by the watershed line which runs E. and W. from Inverury.	—	—	—	—	—
93.	**Aberdeenshire North** ...	—	—	—	—	—
94.	**Banffshire**	—	1	—	1	1
95.	**Elginshire** ... ... Includes the detached portion of Invernessshire which separates the two portions of Elginshire.	—	—	—	—	—
96.	**Easterness** ... ... To form the vice-counties 'Easterness' and 'Westerness,' Inverness-shire is first divided by the line of watershed between the East and West of Scotland, continued along Loch Erricht to the Perthshire border. The Eastern portion (with Nairnshire added) is called Easterness. The Western portion (with the detached portion of Argyleshire situated N.W. of Loch Linnhe) is called Westerness.	—	—	—	—	—
97.	**Westerness** ... ... See above for definition.	—	—	—	—	—
98.	**Main Argyleshire** ... ... This is what is left of the County after the separation of Cantire, the Islands, and the portion N.W. of Loch Linnhe.	—	—	—	—	—
99.	**Dumbartonshire** ... The detached portion is included with Stirlingshire.	—	—	—	—	—
100.	**Clyde Islands** ... ... Bute, Arran, Cumbray, and Ailsa Craig.	—	—	—	—	—
101.	**Cantire** ... ... This peninsula is separated from Argyleshire by the Crinan Canal.	—	—	—	—	—

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
102.	**Ebudes South** ... ... The Islands of Jura, Colonsay, and Islay.	—	—	—	—	—
103.	**Ebudes Mid** ... ... The Islands of Mull, Coll, Tirree, Staffa, Iona, &c.	—	—	—	—	—
104.	**Ebudes North** ... ... The Islands of Skye, Canna, Rum, Muck, Eig, &c.	—	—	—	—	—
105.	**Ross-shire West** ... Separated from East Rossshire by the watershed line parting East and West Scotland. Includes some of the fragments of Cromarty County.	—	—	—	—	—
106.	**Ross-shire East** ... ... Includes fragments of Cromarty and Nairnshire.	—	—	—	—	—
107.	**Sutherland South-East** Divided from North-West Sutherland by the watershed line parting the East and West sides of Scotland.	2	14	1	17	23
108.	**Sutherland North-West** ...	1	7	5	13	21
109.	**Caithness**	—	—	—	—	—
110.	**Hebrides**...	—	—	—	—	—
111.	**Orkneys**	—	—	—	—	—
112.	**Shetland Islands**	—	—	—	—	—
113.	**Londonderry County**... The city of Londonderry is included with Donegal County.	—	—	—	—	—
114.	**Antrim County**	—	—	—	—	—
115.	**Down County** ...	—	—	—	—	—
116.	**Armagh County**	—	—	—	—	—
117.	**Monaghan County** ...	—	—	—	—	—
118.	**Tyrone County**	—	—	—	—	—
119.	**Donegal County** ... Includes Londonderry City.	—	—	—	—	—
120.	**Fermanagh County** ...	—	—	—	—	—
121.	**Cavan County** ...	—	—	—	—	—
122.	**Louth County**	—	—	—	—	—
123.	**Meath County** ...	—	—	—	—	—

		Slugs.	Land-shells.	Fresh-water shells.	Total species.	Total No. of records.
124.	**Dublin County**	—	—	—	—	—
125.	**Kildare County** ...	—	2	—	2	3
126.	**Wicklow County**	—	—	—	—	—
127.	**Wexford County** ...	—	2	—	2	2
128.	**Carlow County**	—	—	—	—	—
129.	**Kilkenny County** ...	—	—	—	—	—
130.	**Queen's County**	—	—	—	—	—
131.	**King's County** ...	—	—	—	—	—
132.	**Westmeath County** ...	—	—	—	—	—
133.	**Longford County** ...	—	—	—	—	—
134.	**Roscommon County** ...	—	—	—	—	—
135.	**Leitrim County** ...	—	—	—	—	—
136.	**Sligo County**	—	—	—	—	—
137.	**Mayo East** ... ... Separated from West Mayo by the railway from Ballina to the head of Lough Mask.	—	—	—	—	—
138.	**Mayo West**	—	—	—	—	—
139.	**Galway West** ... Separated from East Galway by Lough Corrib.	—	2	—	2	2
140.	**Galway East**	—	—	—	—	—
141.	**Clare County**	—	—	—	—	—
142.	**Limerick County** ...	—	—	—	—	—
143.	**Tipperary North** ... ... Divided from South Tipperary by the line of watershed.	—	—	—	—	—
144.	**Tipperary South** ...	—	—	—	—	—
145.	**Waterford County** ...	8	1	1	10	11
146.	**Cork North** ... ... Divided from South Cork by the River Lee.	—	—	—	—	—
147.	**Cork South**	—	1	—	1	1
148.	**Kerry County** ...	1	—	—	1	1
	For comparison we give the number of species known to inhabit the British Isles, as given in the Conchological Society's List	15	71	46	132	

The above was written at the close of last year; and although a large number of specimens have been examined during the three months which have since elapsed, we think it well to allow the figures to stand as given in the original M.S.

BIBLIOGRAPHY.

A Monograph of the Land Shells of Tasmania. —By W. F. Petterd.

Since the publication of Dr. Cox's Monograph of Australian Land Shells, in which only 21 species are noticed as inhabiting Tasmania, the knowledge of the subject has been greatly augmented, principally by Mr. Legrand (who a few years ago published his "Collections for a Monograph of Tasmanian Land Shells," which embraced not only the known species, but contained descriptions of a number of new forms not previously published), and Mr. Brazier (who has described a number of species in the 'Proceedings of the Zoological Society of London').

More extended observations show that much confusion has occurred by variations of the different forms having been regarded and recorded as distinct species.

Mr. Petterd in his excellent work has rendered good service to conchology by pointing out where the so-called species have been varieties only of some previously known kind. The distribution of the different species is fully given and the synonymy compiled with evident care and accuracy. The total number of land shells found on the island appears to be 79, of which number Dr. Cox has described 26, Brazier 14, Tenison-Woods 4, Beddome 3, Pfeiffer 6, the Author 17, and the remainder are attributable to various English and foreign conchologists.

Two species are introduced European forms: *Zonites cellarius* and *Helix pulchella*; and two large and conspicuous species, *Helix bisulcata* and *Helix subangulata*, though labelled

in the British museum as from Van Diemen's Land, have not been found and remain unique.

The whole work is well and carefully done, the variations of each species as far as known are described, copious lists of localities are given, the critical remarks under each species are judicious and well considered, and the author may be congratulated upon the thorough manner in which the subject has been treated.—J.W.T.

LIST OF LAND AND FRESHWATER MOLLUSCA COLLECTED AT PETERBOROUGH.

By A. W. NICHOLLS.

[Read before the Conchological Society.]

Name.	Locality.	Geological formation.	Remarks.
Achatina acicula	River Lane	Gravels	Rare.
Ancylus fluviatilis	River Nene		Scarce.
Ancylus lacustris	,,		,,
Anodonta cygnea	,,		,,
Anodonta anatina	,,		Common.
Do. var. *radiata*	,,		Scarce.
Do. var. *ventricosa*	,,		,,
Arion ater	Fletton	Oxford Clay	Common.
Arion hortensis	,,	,,	Common.
Assiminea Grayana	River Nene	,,	Rare.
Balea perversa	Fletton and Thorpe	Oxford Clay & Cornbrash	Scarce.
Bulimus obscurus	,,	,,	General.
Bythinia tentaculata	River dykes		Common
Do. var. *albida*	,,		Scarce.
Bythinia Leachii	,,		Frequent.
Carychium minimum	River Lane		Frequent.
Clausilia rugosa	Thorpe, and Fletton	Cornbrash	,,
Clausilia laminata	,,	,,	Local.
Cochlicopa lubrica	Thorpe, Fl'tton	,,	Common.

Name.	Locality.	Geological formation.	Remarks.
Cyclostoma elegans	Thorpe, Fl'tton		Local.
Dreissena polymorpha	River Nene		General.
Helix aspersa	Thorpe and Fletton	Cornbrash & Oxford Clay	Common.
Helix arbustorum	,,	,,	,,
Do. var. *flavescens*	Thorpe		Scarce.
Do. var. *major*	,,		,,
Helix cantiana	,,		,,
Helix caperata	River Lane	Clay	Frequent.
Do. var. *ornata*	Thorpe	Cornbrash	Scarce.
Helix ericetorum	,,	,,	General.
Do. var. *albida*	,,	,,	Frequent.
Helix hispida	Thorpe and Eastfield	,,	Common.
Do. var. *subrufa*	Thorpe	,,	
Helix hortensis			
Do. var. *hybrida*	,,	,,	Frequent.
Helix lapicida	,,	,,	Local.
Helix nemoralis	,,		General.
Helix pulchella	,,	,,	
Do. var. *costata*	,,	,,	
Helix rotundata	River Lane	Gravel	Frequent.
Helix rufescens	River Lane & Thorpe		Common.
Do. var. *albida*	River Lane		Frequent.
Helix sericea	,,		,,
Helix virgata	Fletton & Thorpe		General.
Do. var. *albida ?*	Thorpe		
Limax marginatus	Fletton		General.
Limax flavus	,,		,,
Limax agrestis	,,		,,
Limnæa auricularia	River Nene		Scarce.
Limnæa peregra	,,		Common.

Name.	Locality.	Geological formation.	Remarks.
L. peregra var. *ovata*	River Nene		Scarce.
Do. var. *acuminata*	,,		,,
Limnæa palustris	River Nene dykes		Common.
Limnæa stagnalis	,,		,,
Do var. *fragilis*	,,		Scarce.
Limnæa truncatula	,,		Common.
Neritina fluviatilis	River Nene		,,
Paludina contecta	River Nene dykes		,,
Physa fontinalis	River Nene & Orton		,,
Physa hypnorum	,,		,,
Pisidium amnicum	River Nene		Common.
Pisidium fontinale	River Nene dykes		Scarce.
Pisidium roseum	,,		Scarce.
Planorbis albus	,,		,,
Planorbis carinatus	,,		General.
Planorbis complanatus	,,		,,
Planorbis corneus	,,		Common.
Planorbis contortus	,,		General.
Planorbis vortex	,,		Common.
Pupa umbilicata	Thorpe, Orton.	Cornbrash	Common.
Sphærium rivicola	River Nene		Rare.
Sphærium corneum	,,		Common.
Do. var. *nucleus*	,,		Rare.
Do. var. *flavescens*	,,		Rare.
Sphærium lacustre	River Nene dykes		Scarce.
Succinea putris	River Lane & Whittlesea	Oxford Clay	General.
Succinea elegans	,,	,,	
Unio pictorum	River Nene		General.
Do. var. *radiata*	,,		Scarce.
Do. var. *compressa*	,,		,,

Name.	Locality.	Geological formation.	Remarks.
Unio tumidus	River Nene		Scarce.
Do. var. *ovalis*	,,		,,
Vitrina pellucida	Thorpe		Frequent.
Vertigo pygmæa	Thorpe, Fletton		Scarce.
Valvata piscinalis	River dykes		General.
Do. var. *depressa*	,,		Frequent.
Valvata cristata	,,		,,
Zonites cellarius	River Lane and Thorpe	Cornbrash	General.
Zonites crystallinus	Thorpe		,,
Zonites excavatus	,,		,,
Zonites fulvus	River Lane	Gravels	Rare.
Zonites nitidulus	Fletton and Thorpe	Oxford Clay	General.
Zonites nitidus	Thorpe	Cornbrash	,,

AUTHENTICATED MATERIALS FOR A LIST OF THE LAND AND FRESH-WATER MOLLUSCA OF MID-WEST YORKSHIRE.

[Extracted from the Record-Books of the Conchological Society].

PART I.

Fresh-water Shells.

Yorkshire is divided—for the purpose of recording the localities of mollusca—into five vice-counties, the same as are used by botanical topographers. Three of these are on the western side of the central dividing line of the county (the rivers Wiske, Swale, and Ouse), and the one now dealt with is, as its name implies, the middle of the three. Its northern boundary is formed by the familiar line of demarcation between the North and West Ridings, which is however continued westward in such a manner as to throw the Dent and Sedbergh district into North-West Yorkshire. The line which separates our present district from South-West Yorkshire is purely arbitrary,

being the Leeds and Liverpool canal from the point at which it enters the county down to Leeds, the river Aire continuing the boundary from that town to its own junction with the Ouse.

Mid-West Yorkshire, although quite destitute of sea-board, is a highly diversified tract of country, including the whole of the drainage-basins of the Nidd, the Wharfe, and the Washburn, the northern strip of the whole length of the Aire Valley, the upper basin of the Ribble, and a small part of the valley of the Ure. In point of level it ranges from 2414 feet at Whernside and 2373 feet at Ingleborough, down to the flat alluvial districts of the plain of York, scarcely if at all above sea-level. Geologically it includes rocks of palæozoic age in its mountain-masses, carboniferous limestones followed by millstone grit and coal measures occupying much of its western and mid area. The belt of Permian limestone crosses the vice-county from north (at Staveley) to south (at Fairburn), and the eastern portion of the district is occupied by glacial drifts overlying the Triassic and diluvial rocks of the vale (or plain) of York. The central axis of drainage of Great Britain passes through the vice-county, the Ribble draining westward into the Irish Sea, while the other streams of the district flow east into the estuary of the Humber.

With so diversified an area to inhabit, the fauna is rich, as the present and succeeding lists will show. In fact specimens have been shown from so many localities that it is necessary in the case of some of the common species to give generalizations and omit the detailed records upon which they are founded.

The collectors to whom the society is indebted for the sight of the specimens upon which this paper is exclusively founded are the following:—Thos. W. Bell, M.C.S. (Leeds), J. D. Butterell, M.C.S. (Beverley), James Carter (Masham), W. Eagle Clarke, F.L.S. (Leeds), H. Crowther (Leeds), James Ingleby (Eavestone), W. Nelson, M.C.S. (Leeds), H. Pollard (Leeds), Thomas Pratt (Ripon), W. Denison Roebuck, F.L.S.

(Leeds), H. Shaw (Leeds), C. Smethurst (Leeds), J. W. Taylor, (Leeds), the late James Varley (Huddersfield), William West, M.C.S. (Bradford), Rev. E. P. Knubley (Staveley), and R. M. Christy (late of York).

The great value of an 'authenticated' list being that every record included in it has been verified by means of the specimens upon which it is based having been submitted to the Society's Referees and carefully determined by them, it has not been thought necessary to append the collectors' initials to their records. Suffice it to say that Messrs. John W. Taylor and William Nelson, the referees, have examined all the specimens referred to; and it may be added that the present paper is not—and does not aim at being—a complete list of the shells of the area under consideration, for it does not profess to do more than summarize what the referees have actually had before them.

Sphærium corneum (L.).—Common at Gisburn, Ribblesdale; plentiful at various points, and no doubt all along the Leeds and Liverpool canal; in a stream at Meanwood; canal, Ripon; ponds, Masham; Askham Bog; Knaresborough, Wetherby, Bramham, and Tadcaster.

S. corneum var. **nucleus** (Stud.).—Numerous specimens in Malham Tarn.

S. rivicola (Leach).—Adel near Leeds; canal at Shipley, at Kirkstall, and at Monk Bridge, Leeds.

S. lacustre (Müll.).—Occurs in ponds at Baildon Green, Gilstead near Bingley, Newton Kyme, and at Osmondthorpe and Whinmoor near Leeds.

S. lacustre var. **Ryckholtii** (Norm.).—In a pond at Black Hills, Leeds.

Pisidium amnicum (Müll.).—A few dead valves found in the Wharfe near Woodhall Bridge.

P. fontinale (Drap.).—Ingleborough, amongst *Polytrichum* and *Sphagnum*; Knaresborough; Starbotton in Wharfedale; Malham; Grewelthorpe near Ripon; Whinmoor near Leeds; Tadcaster.

P. fontinale var. **cinerea** Alder.—Common in Shipley Glen; occurs at Eavestone near Ripon

P. pusillum (Gmelin).—Eavestone, common in a ditch; Swinsty reservoir, Washburndale; Pannal; Osmondthorpe and Chapel Allerton near Leeds; Bishopthorpe Ings, common; Malham Tarn marsh, 1,200 feet above sea-level, common; Baildon Moor and Shipley Glen.

P. nitidum Jen.—Baildon Green, several specimens.

Unio tumidus Phil.—The lake at Roundhay Park near Leeds.

U. pictorum (L.).—Abundant at Studley Royal.

Anodonta cygnea (L.).—Abundant in Shepherd's Pond and in Roundhay Park lake, Leeds; and in Studley Lake near Ripon; also shown from Tadcaster.

A. anatina (L.).—Studley Lake near Ripon.

Dreissena polymorpha (Pallas).—Common in the Leeds and Liverpool canal at Newlay, Kirkstall, Armley, &c.

Neritina fluviatilis (L.).—Rivers Ure, at Hackfall; Ouse, at York; Wharfe, at Tadcaster.

N. fluviatilis var. **nigrescens** Colb.—Common in the Ouse, at York, along with the type.

Paludina vivipara (L.).—Common in the Ouse, at York; also in the canal at Selby.

Bythinia tentaculata (L.).—Staveley mill-pond; canal, Ripon; Askham Bog; Tadcaster; stream at Allerton Bywater; common in the canal at Armley, Kirkstall, Newlay, Saltaire, and Bingley; common in a pond at Gisburn; a few in Malham Tarn.

[**B. Leachii** has not as yet been authenticated by specimens from this district].

Valvata piscinalis (Müll.).—Malham Tarn; pond at Gisburn; not yet shown from east of the Pennine Hills.

V. cristata Müll.—Common in Askham Bog; Barlow Common near Selby.

Planorbis lineatus Walk.—Askham Bog, abundant.

P. nitidus (Müll.).—Asp ponds, Knaresborough; Cambles-forth.

P. nautileus (L.).—Common in ponds at Stony Rock, Osmondthorpe and Black Hills, Leeds; occurs in Malham Tarn.

P. nautileus var. **crista** (L.).—Pond at Osmondthorpe, rather common; pond near Roundhay, Leeds.

P. albus Müll.—Waterloo Lake, Roundhay; stream at Meanwood, and mill-goit at Adel; canal at Saltaire; Carlton pond near Snaith.

P. spirorbis Müll.—Common in Malham Tarn moss; Starbotton, Linton, Wetherby, and Newton Kyme, Wharfedale; Sicklinghall; Castleford; ponds at Camblesforth and at Carlton near Snaith; ditch near Balne Moor; Barlow Common near Selby.

P. vortex (L.).—Pond at Gisburn; pond at Blackhills, Leeds; Carlton Pond near Snaith; stream, Allerton Bywater; pond at Church Fenton; canal at Burton Hall and ditch near Selby.

P. carinatus Müll.—Canal at Ripon; ponds, Askham and Dringhouses near York; canal at Selby; common in ditches, Church Fenton; Castleford; reservoir at Cross Stamford Street, Leeds; abundant in a pond at Baildon Green.

P. carinatus var. **disciformis** Jeff.—Castleford.

P. complanatus (L.).—Ponds near Masham; Naburn Lock, plentiful; Dringhouses or Askham Bog, common; Bishopthorpe near York; Wetherby and Healaugh; Leventhorpe pastures and ponds at Black Hills and Roundhay near Leeds; Carlton near Snaith; ditch near Balne Moor.

P. complanatus var. **rhombea** (Turt.). — Brickpond at Stanks, Sēacroft, near Leeds.

P. corneus (L.).—Common in ponds at Masham and in the canal near Ripon; Askham Bog, common; near Church Fenton; common in ponds at Black Hills and Osmondthorpe near Leeds; common in pond on Baildon Green.

P. contortus (L.).—Gisburn, plentiful; Malham Tarn, abundant; Staveley; Askham Bog, common; Leventhorpe pastures and Black Hills near Leeds; Carlton near Snaith; Barlow Common near Selby.

P. contortus var. **albida** Jeff.—Castleford.

Physa hypnorum (L.).—Wetherby; ditch near Castleford; Carlton near Snaith.

P. fontinalis (L.).—Ripon Canal; Eavestone near Ripon; Staveley; common at Askham Bog; Carlton Pond near Snaith; Bishop Dyke near Sherburn; stream at Allerton Bywater; pond at Black Hills, Leeds; Tadcaster; plentiful at Gisburn; Barlow Common near Selby.

Limnæa peregra Müll.—Specimens shown from very numerous localities about York, Wetherby, Leeds, Snaith, Ripon, Harrogate, Shipley and Baildon, Castleford, Ilkley, and other places, also from Ingleton, Gisburn, Bracewell, Buckden and Starbotton, from the marsh at Malham Tarn, and from Washburndale. Very variable and usually plentiful.

L. peregra var. **ovata** Drap.—Pannal; canal at Kirkstall, &c.; Gisburn; Malham Tarn; Malham Cove; Fewston reservoir; &c.

L. peregra var. **acuminata** Jeff.—Malham; Bishop Thornton.

L. auricularia (L.). — Canal, Ripon; Fewston reservoir; river Aire near Bingley; pond at Allerton Grange, Leeds; lower lake, Roundhay Park.

L. stagnalis (L.).—Masham, ponds, large and fine; Wetherby; Askham Bog; pond, Black Hills, near Leeds.

L, stagnalis var. **fragilis-variegata.**—Common in Malham Tarn.

L. palustris (Müll.).—Gisburn, in pond; numerous near the river at Kilnsey in Upper Wharfedale; Askham Bog; near Ryther; Carlton pond near Snaith; canal, Kirkstall; Leventhorpe pastures near Leeds.

L. palustris var. **lacunosa** Zgl.—Leventhorpe pastures.

L. palustris var. **fasciata** Nels.—Leventhorpe pastures.

L. palustris var. **roseolabiata** Jeff.—Leventhorpe pastures.

L. truncatula Müll.—Numerous localities round Leeds, especially eastward of it; Newton Kyme and Tadcaster; Staveley; Pannal; Knaresborough; Masham; Eavestone; Bishopthorpe Ings; various places near Selby; Shipley Glen and Baildon; Draughton; Ingleton; Malham Tarn and marsh.

L. truncatula var. **elegans** Jeff. — Osmondthorpe, Leeds; Newton Kyme near Tadcaster.

L. glabra (Müll.).—Ditch at Whinmoor near Leeds; Cambles-forth; Knavesmire, York; ditch near Woodhall Bridge.

Ancylus fluviatilis Müll.—River Skell at Fountains Abbey; Ure at Hackfall and Masham; Staveley; Ingleton; Blubberhouses, Dob Park, and Lindley Wood; Oak Beck near source, at Birk Crag and at Killinghall; Wharfe at Starbotton and Grassington; Ilkley; Pannal, Weeton, and Kirkby Overblow; Malham Cove; Spofforth; Shipley Glen; Newlay; Meanwood, Seacroft, and Chapel Allerton near Leeds; Roundhay Park, in the Gorge, and on a *Ranunculus* in the lake.

A. fluviatilis var. **gibbosa** Bourg.—Roundhay; Ingleton; Thorner; Wharfe at Deepdale Bridge.

A. fluviatilis var. **capuloides** Jan.—Tadcaster.

Ancylus lacustris (L.).—Ponds near Roundhay.

A. lacustris var. **albida** Jeff.—Staveley, near Boroughbridge, on stems and leaves of *Nuphar lutea*.

Occurrence of Acme lineata in North Somerset.—On the 16th inst. I took at Brockley Combe, Somersetshire, on a thallus of *Peltigera canina*, a single specimen of this little shell. I am not aware whether this locality has been previously recorded.—J. W. CUNDALL, Bristol, February 23rd, 1884.

THE DARTS OF BRITISH HELICIDÆ.

By CHARLES ASHFORD.

PART V.

10. **Helix arbustorum** L., pl. viii., figs. 1—4. DART-SAC clavate or cylindrically clavate; usually bluish-grey or livid, but variable in colour; outer surface minutely spotted, inner coat dark brown. DART curved, central part of shaft narrow and nearly cylindrical; base gradually but boldly expanded; head lanceolate, long, thick, broadly-flattened, blunt-edged, polished, opaque; annulus absent. Length 4 to 5 mm.

As in the case of other coloured dart-sacs already described that of *H. arbustorum* is white during the early period of growth and acquires its colouring matter in the later stages of maturation. Its outer coat is grey and obscurely transparent, the inner one brown, modified with red, purple, or violet. The free end of the sac sometimes appears a shade darker than the rest—as is the case also with that of *H. nemoralis*—owing to the greater width of the dark inner sheath in that locality. The sac has no second lobe and is not fused to the vagina.

The dart-sac lies between two long, simple, stout, subulate mucous glands which vary from 15 to 25 mm. in length. They are tough, as thick as the dart-sac itself, and taper to a blunt point (fig. 1). One extremity is occasionally bifid (fig. 2). In colour the glands are grey, tinged with some shade of lavender, dirty-green, dull-blue, ochre, or even russet-orange, sprinkled with minute spots or fine streaks, and it is not uncommon for the dart-sac to share with them the same tint. The reader will recall the simple club-shaped mucous glands of *H. Pisana*. Those of the present species are never like them thickest near the extremity. Particularly interesting is the occasional occurrence of a terminal fissure represented of natural size in fig. 2, as showing the first step towards the highly ramose development acquired by *H. aspersa*, and still more strikingly by *H. pomatia*.

In the dart of this species (fig. 3) we meet with a new type of form essentially distinct from all preceding it, unless we incline to consider the dart of *Zonites excavatus* with its slightly flattened head as an obscure example of the same type. A slender, curved shaft opens out below into a large, long, funnel-shaped base, with its inner line of contour more conspicuously curved than the outer, and expands above—usually with some abruptness—into a substantial, compressed, lanceolate head, the blunt edges of which lie quite or nearly in the plane of curvature. As these edges converge to the transparent, not very sharp point more gradually than they diverge from the neck, the greatest width of the head is below its centre. Between a half and a third of the entire length of the weapon is occupied with this strongly-marked adjunct. Paasch compares it to a myrtle leaf, Verloren to a spatula, Schmidt to a lancet. The central cavity of the dart is continued through the inferior portion of the head, and sometimes extends far into the upper half, but is there contracted into the merest perforation.

Modifications of form are numerous but slight in amount, and altogether unimportant. They have reference to the relative proportion of head, neck and base, to the degree of curvature and the like.

I have never met with the dart in an early stage of formation and can conjecture its appearance only from analogy. When not quite mature (fig. 4) the head is shorter, occupying less than one-third of the total length, rather flatter, more acutely edged, more sharply pointed, having its greatest width nearer its middle, the base is less inflated and the whole weapon less substantial. The figure accompanying Mr. Taylor's Life History of *Helix arbustorum* in the Journal of Conchology, vol. iii., pl. i., fig. 6*a* represents a dart not fully matured.

In one dissection of this species I found a broken dart—wanting the base—lodged in the wall of the oviduct, rather more than half the head protruding into the intervisceral space, if space it may be called where everything is closely packed. It

was evidently working its way from the interior of the oviduct outwards in the manner described in the first section. The animal containing this fragment had a well-developed dart in its sac.

Series of examples from Scarborough sent me by Mr. J. W. Taylor, of Leeds, from Somersetshire procured by Mr. J. H. Ponsonby, of London, and from Christchurch have been examined in the months of July, May, and August respectively. In every case without exception when the mouth of the shell was formed a dart was present. That it is however sometimes lost in conflict is proved by the case of the free dart in the oviduct above referred to.

Fig. 2 is from a specimen from Somerset, fig. 4 from Scarborough, the rest from Christchurch examples.

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11. **Helix lapicida** L., pl. viii., figs. 5—7. DART-SAC slender, cylindrical with a slightly enlarged and rounded end; pearly-white or greyish-white, semi-transparent. DART of the same type as in *H. arbustorum*; shaft extremely slender, round, curved; head lanceolate, much compressed but not broad, with sharp margins; base gradually expanded; annulus absent. Length $3\frac{1}{2}$ to 4 mm.

The dart-sac (figs. 5 and 6) appears to be long on account of its narrowness; it is decidedly less clavate than that of the species last described and is white at all ages. When held to the light or placed in water a thin dark line shows the position of the enclosed dart. I have found it very constant in shape, yet various writers have described it in very different terms. Dr. Lister, who calls it *pyriformis*, figures it nevertheless nearly cylindrical (Exer. Anat., tab. 5, fig. 4).

Accompanying the dart-sac and disposed as in *H. arbustorum* are two simple mucous glands from 9 to 15 mm. long (figs. 5 and 6), but they are more slender and vermiform and less stiff than in the last, and are widest near the bluntly-rounded extremities. No instance of terminal cleavage has come under my notice. *H. Pisana*, *arbustorum*, and *lapicida* are the only British species with two glands normally simple.

The dart (fig. 7) is as fragile in substance as it is elegant in form, and must be isolated by boiling the sac in the usual solution of caustic potash. Different as are the shells of this and the last species there are more points of resemblance in their internal organisation than here described or usually supposed, and a reference to the figures will show that their darts are distinguishable only by the proportion of the several parts. In the present case the head is smaller, absolutely and proportionately, occupying scarcely more than one-fourth of the entire length of the dart, and is flatly compressed with sharper and more transparent margins. I have frequently noticed too an opalescent play of colour on the polished surface of the head when fresh from the dart-sac, but the appearance is fugitive.

I am indebted to Mr. J. H. Ponsonby for living specimens from Yatton in Somersetshire, and I have examined a considerable number from Epsom in Surrey, sent by my late correspondent Mr. J. E. Daniel, and from Swanage, collected by my brother. About 66 per cent. had darts in July, August, and September.

The figures are drawn from the Yatton and Swanage examples.

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12. **Helix pulchella** Müller, pl. viii. figs. 8, 9. DART-SAC elongate oval; pellucid white. DART straight, very acutely conical, without accessories of any kind (?). Length 0.2 mm.

The following information respecting the organs in question in this species is offered subject to confirmation or correction. Further examination is desirable.

When the dissection turned out favourably the dart-sac (fig. 8) appeared to be rather long and narrow, broadest in the middle and somewhat pointed. I could detect no mucous glands, and Moquin-Tandon says there are none, though in his diagnosis of the subgenus Lucena, of which he makes *H. pulchella* the only French representative, a note of doubt is added to the same statement.

A mounted dart now before me is represented in fig. 9, enlarged 100 diameters. It seems to be an extremely attenuated cone without blades or annulus. Whether this be the form of a mature weapon or not I must leave.

Dr. Goldfuss mentions the dart in his catalogue of Mollusca found in the Rhine-province and Westphalia, 1855, and I have met with no earlier reference. That author remarks "*H. pulchella* and *H. costata* have a comparatively long, straight dart."

The figures are from a specimen taken near Christchurch.

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13. **Helix aspersa** Müller, pl. viii. figs. 10—18. DART-SAC broadly clavate or subpyriform, sometimes indistinctly ringed at the neck, white at all ages. DART curved, furnished with four thin, sharp-edged blades, all equally salient or two broader than the others; neck long; base conically expanded; annulus of 14 to 18 rods. Length 8 to 9 mm.

Both coats of the ample, firm, simple sac (fig. 10) are white but not quite opaque, for the position of the enclosed dart is indicated by transmitted light. The outer envelope is thick and tough, the inner one more spongy. In *H. nemoralis* the core of the tubercle supporting the dart is violet, in the present species opaque white.

Conspicuous by their small size in relation to the animal and by their multifid habit, the mucous glands form two bushy tufts not extending far beyond the end of the dart-sac. In this country they vary from 9 to 12 mm. in length, but naturally attain a greater length in regions more favourable to the development of large shells. The short, thick stalk divides into 2 to 5 branches, each supporting a very variable number of slender vermiform bluntly-terminated branchlets, white with a tinge of blue. Scarcely two individuals are alike in the number of terminals or mode of subdivision, and the companion glands of the same animal differ in the former respect within narrow numerical limits. Adults have usually from 20 to 30

terminals to each gland; in the case of juniors the branches are shorter and fewer, from which we may fairly conclude that the process of ramification as well as increase of length goes on *pari passu* with the growth of the animal. Figures 11 and 12 represent the two extremes that have come under my own observation, one with only 14 terminals (animal adult, dart perfect), the other with the unusual number of 46. Note in fig. 12 two or three examples of terminal budding, and compare with a similar case (fig. 2) in *H. arbustorum*.

The curvature of the dart (fig. 13) is somewhat variable and sometimes nearly confined to the apical half. Capt. Thos. Brown, in his 'Illustrations of Land and Freshwater Conchology,' represents it nearly straight, but I have never found it so. A little above the point where the base begins to enlarge, start the four simple blades, increasing in breadth more rapidly and converging towards the point more gradually than in *H. nemoralis*, so that their greatest width is attained below the middle of their extent. If the dart be snapped near the middle the four blades will usually be found equally salient as seen in the section (fig. 13), if broken near the point the two pairs will as commonly be found unequal owing to one pair feathering off sooner than the other pair. A very abnormal form, almost amounting to a monstrosity, is shewn in fig. 15, where the principal blades—viz., those in the plane of curvature—have been unduly developed apparently at the expense of the side blades. Fig. 14 shows a real case of malformation, the result probably of injury during growth.

The darts of *H. aspersa* and *H. nemoralis* resemble each other in the general aspect of the base, in the singular combination of brittleness and softness when moist from the sac, and in the character and disposition of the crescentic films between the blades.

Dr. Martin Lister (1694) mentions and figures the dart of this species. Montagu (1805) justly ridicules the notion prevalent before his time, that these weapons were used as missiles.

"Perhaps we may be told hereafter," he adds playfully, "that this excretory fluid" (connecting the dart and tubercle) "is used as a cord to regain these darts after they have been discharged."

Immature darts in various stages are to be met with rather frequently (say one in seven). It will be sufficient to refer to fig. 17 where three examples are represented to the same scale. The blades of *a* have made some advance, in *b* they are just sprouting, and the section of *c* would probably be quadrangular. The lower part of a dart approaching completion is shown much enlarged in fig. 16. This presents some interesting features. Observe the formative process going on in the lower part of the blades, the portion not included in the figure being finished. The base of the shaft is just beginning to enlarge, and it is evident the conical expansion when formed will add its own length to the present length of the dart. For if this conical portion were produced by the addition of material to the exterior of the curved surface already existing, the final basal marginal ring would necessarily be very thick, whereas in the completed dart we always find that margin extremely thin. It does not necessarily follow, but it seems probable that the annulus of little rods (see fig. 13) cannot be formed, or at least cannot make attachment to the dart until this increment has been added. The blades meantime are embedded in the sides of the inner sac, in deep trenches, very conspicuous in the case of *H. aspersa*, and first described by Cuvier.

Free darts, as foreign bodies, occur rather frequently in the species under notice. One such I found between the spermatheca and oviduct, another among the branches of the mucous glands, the dart-sac in this case containing its proper weapon, a third in the common genital passage, point downwards, a fourth in the integument beneath the mantle. On the 9th of April, about seven days after the general exodus from hibernation, one individual having a dart complete with annulus in its sac, harboured in its other organs two errant darts, one with its

point penetrating the ovotestis, the other in two fragments, of which the basal portion with annulus attached, was partly embedded in the inferior margin of the albumen gland, the rest minus the point adhered to the exterior of the oviduct. From their discoloured and partly disintegrated condition these fragments had probably been the animal's guests throughout the winter.

By direct observation of this species M. Pérez satisfied himself that a new dart is formed to supply the place of a lost one. Selecting coupled individuals he kept them in captivity and dissected some after an interval of twenty-four hours, others after two days, and so on. He says that sacs opened after a lapse of one day already contained fine calcareous needles usually 1·5 to 1·75 mm. long; those examined after two days had darts about 3·5 mm. long; on the third day they were 6 to 7 mm.; and on the fifth or sixth day renewal was complete.

Summing up as before (shells perfect always understood), I find 56 per cent. had darts—one third of them more or less immature—25 per cent. had not formed darts, and 19 per cent. had mature but empty sacs.

Darts may be found present in *H. aspersa* in every month of the year. In the middle of December, eight full-grown shells were selected from a hibernating group; six of them yielded darts. As no satisfactory evidence is yet forthcoming that the formative process goes on during winter sleep, we must conclude provisionally the six individuals referred to had either retained the darts used during the preceding summer, or having lost their weapons had renewed them in late autumn before retiring for the winter.

All the figures are from examples collected at Christchurch.

LIST OF MOLLUSCA OF PRESTON CANDOVER, NORTH HANTS.

By H. PUREFOY FITZGERALD.

The following is a list of the Land and Fresh-water Mollusca found at and around Preston Candover in North Hants.

North Hants is one of the counties which has never been properly examined as regards the Mollusca. The part of the county in which are found the species named in the following list lies between Basingstoke and Alresford, the Fresh-water Mollusca being taken from the river Itchen, not far from where it rises, so that only a small portion of North Hants has been examined, and I am afraid that it will be some little time before the whole vice-county is thoroughly searched, as it is almost too much for one person to do without any help. The remarks are based simply on my own observations, and some, which I have said are scarce, may have been overlooked. There may even be, and most likely are, a few more species which I have not come across. The varieties have nearly all been examined by Mr. J. W. Taylor.

Helix pomatia only occurs, as far as my knowledge extends, in three or four fields in one locality in North Hants; the var. *albida* I believe to be owing to the age of the snail, as I have never seen a young specimen colourless. As to *H. aspersa* var. *zonata*, I have observed several dead shells, but up to the present time only one live specimen. I have not mentioned the Limacidæ in the list as I hope to treat upon them in a separate paper.

1. **Pisidium amnicum** (Müll.). Common.
2. **P. nitidum** Jen. Frequent.
3. **P. pusillum** (Gmelin). Frequent.
4. **Bythinia tentaculata** (L.). Common.
5. Do. var. **albida** Rimmer. Scarce.
6. **Valvata piscinalis** (Müll.).
   Do. var. **depressa** C. Pfr. Scarce.

7. **V. cristata** Müll. Scarce.
8. **Planorbis nitidus** (Müll.). Scarce.
9. **P. albus** Müll. Scarce.
10. **P. spirorbis** Müll. Common.
11. **P. carinatus** Müll. Frequent.
12. **P. contortus** (L.). Frequent.
13. **Physa fontinalis** (L.). Scarce.
14. **Limnæa peregra** (Müll.). Common.
15. Do. var. **acuminata** Jeff. Frequent.
16. Do. var. **labiosa** Jeff. Frequent.
17. Do. var. **candida** Porro. Scarce.
18. **L. stagnalis** (L.). Frequent.
19. **L. palustris** (Müll.). Common.
20. **L. truncatula** (Müll.). Scarce.
21. **Ancylus fluviatilis** Müll. Frequent.
22. **Succinea putris** (L.). Common
23. **Vitrina pellucida** Müll. Frequent.
24. **Zonites cellarius** (Müll.). Common.
25. **Z. crystallinus** (Müll.). Scarce.
26. **Helix pomatia** L. Scarce.
27. Do. var. **albida** Moq. Scarce.
28. **H. aspersa** Müll. Common.
29. Do. var. **zonata** Moq. Scarce.
30. Do. var. **undulata** Moq. Scarce.
31. **H. nemoralis** L. Common.
32. Do. var. **libellula** Risso. Frequent.
33. Do. var. **rubella** Moq. Frequent.
34. Do. var. **castanea** Moq. Frequent.
35. **H. hortensis** Müll. Common.
36. Do. var. **lutea** Moq. Frequent.
37. Do. var. **incarnata** Moq. Frequent.
38. Do. var. **castanea** Taylor. Frequent.
39. **H. arbustorum** L.
40. Do. var. **pallida** Taylor. Scarce.
41. **H. cantiana** Mont. Common.

42. **H. rufescens** Penn. Common.
43. Do. var. **rubens** Moq. Scarce.
44. **H. sericea** Müll.
45. Do. var. **cornea** Jeff. Scarce.
46. **H. virgata** Da Costa. Common.
47. Do. var. **albicans** Grat. Scarce.
48. **H. caperata** Mont. Frequent.
49. **H. ericetorum** Müll. Common.
50. Do. var. **minor** Moq. Frequent.
51. Do. var. **alba** Charp. Frequent.
52. **H. rotundata** Müll. Frequent.
53. **H. pulchella** Müll. Frequent.
54. **H. lapicida** L. Common.
55. **Bulimus obscurus** (Müll.). Frequent.
56. **Pupa marginata** Drap. Scarce.
57. **Clausilia rugosa** (Drap.). Frequent.
58. **C. laminata** (Mont.). Frequent.
59. **Cochlicopa lubrica** (Müll.). Common.
60. **Carychium minimum** Müll. Scarce.
61. **Cyclostoma elegans** (Müll.). Common.

Pupa secale var. **minor** Moq-Tand. **in Britain.**—Through the kindness of Captain Becher, R.A., of Hill House, Southwell, I have had the pleasure of looking over an assortment of land and freshwater shells collected by him at Clayton, Sussex. Amongst other interesting specimens I found the var. *minor* of *Pupa secale*, which has not previously been recorded for this country. Moquin-Tandon describes it as much smaller than the type, but Dr. Westerlund, in his "Fauna Europæa Molluscorum extramarinorum," fixes the dimensions as 6½ mill. The Clayton specimens average about 5½ mill., some being even rather less than that. The length of the normal form as given by Jeffreys and others is 7½ mill.—J. W. TAYLOR, June 21st, 1884.

LLANDUDNO AND DENBIGHSHIRE MOLLUSCA.

By WM. DENISON ROEBUCK, F.L.S.

During the month of July, 1883, I had the opportunity of collecting mollusks in four counties of North Wales. Notes appear elsewhere on those obtained in Flintshire and Carnarvonshire, and the present paper records those obtained in the Creuddyn peninsula (on which Llandudno is situated), and in adjoining portions of Denbighshire. For although this peninsula is politically a portion of Carnarvonshire, it is geographically continuous with Denbighshire, and as such I propose to treat it, together with all the other outlying pieces of Carnarvonshire which are E. of the river Conway.

My observations were for the most part confined to the Creuddyn peninsula itself, which may be considered as being composed of two masses of carboniferous limestone hills connected by an isthmus of perfectly flat and level country, which in its natural and original condition was marsh-land, as its Welsh name ('Morfa') and the presence of numerous straight cut drains denotes. The outermost hill is the famous Great Orme's Head, so familiar from its bold and picturesque outline to all who have sailed past the coast of North Wales. The Great Orme's Head, a boss of limestone which rises sheer from the sea and from the Morfa to a height of about 325 feet, is covered with grassy sheep-pastures and abundance of loose stones. Upon it are found in abundance *Helix virgata*, *H. aspersa*, *H. caperata*, *H. rotundata*, and *Pupa umbilicata*, and on it also occur in more or less numbers *Zonites alliarius*, *Helix rupestris*, *H. pulchella*, and *Cochlicopa lubrica*. In a sheltered hollow on its eastern aspect, called the 'Happy Valley,' *Cyclostoma elegans* was very numerous in 1877; and right on the top of the hill is a sheltered field in a hollow, which abounds in flowers, and in which most of the shells mentioned, together with *Clausilia rugosa*, occur in considerable numbers. Of water

shells I have only seen one species—*Limnæa peregra*, which was numerous in a new cattle trough near the summit. The 'Morfa' is immediately to the south of the Great Orme's Head, separating it completely from the hills of the southern mass. This 'Morfa' (or marsh, as it is literally translated) is level, and covers about four or five square miles. A great part of the western portion of it is covered with bracken and not conchologically productive, but the eastern portion is under cultivation, and intersected with straight-cut drains and hedges. A large area of this eastern portion is occupied by the fashionable watering place of Llandudno, which stretches for about a mile in length from where its older portion nestles close under the shelter of the Great Orme. The drains and ponds of the flat country are inhabited only by *Limnæa peregra*, save in one pond in Abbey-road, close under the S.W. escarpment of the Great Orme, which yields *Sphærium lacustre* and *Physa hypnorum* also. The damp roadside puddles of the Morfa are inhabited by *Succinea putris*, while *Helix nemoralis*, in great variety of colour and markings, swarms along the roadsides in company with *H. aspersa* and *H. virgata*, and lesser numbers of *H. caperata*. The short crisp turf which borders Llandudno Bay from the end of the promenade to the foot of the Little Orme's Head is alive with *H. virgata* and *Bulimus acutus*, and they also occur on the summit valleys of the Little Orme, to about 200 or 300 feet above the sea.

The southern mass of hills is broken up into three or four more or less prominent steep-sided eminences of rounded outline, such as the Little Orme's Head, Gloddaeth Mountain, Pydew Mountain, and Deganwy Castle Hill, &c. Conchologically they reproduce the main features of the Great Orme's Head, with the difference that the lower slopes of the Gloddaeth and Pydew mountains are clothed with a luxuriant growth of woodland, known as Gloddaeth and Bodscallan woods, thus giving shelter for woodland and moisture-loving species of mollusca. In this vicinity is a very old wall at Bodscallan, whose

stones (some of them loose) are embedded in a profusion of good limy mortar. The crevices of this wall yield a number of species in abundance, such as *Balea perversa* and *Helix rupestris*, with *H. pulchella* and its var. *costata*, *Clausilia rugosa*, and *Pupa umbilicata* also in profusion. The woods near yielded *Carychium minimum*, *Zonites crystallinus*, *Helix pygmæa*, &c. after much search. On the southern slopes of these hills, about Llangwystenin, and in the more level country towards Llandrillo-yn-Rhos, Rhos Fynach, and Colwyn Bay, a few odd things were collected.

Most of the collecting was done in the district which has just been described, and which is wholly limestone, and the only part of Denbighshire proper which was visited was along the right bank of the Conway River. A walk of ten miles from Llanrwst to Llansantffraid-glan-Conway, with the accompaniment of torrents of rain, was the occasion upon which were collected the species cited for Llanrwst and Tal-y-Cafn. The results were meagre, due more to the unproductiveness of the Silurian slates than to the inclemency of the weather. It was upon this occasion that I had the opportunity of collecting the beautiful gelatinously translucent tree-slug, *Limax arborum*, in such numbers as I had never before seen it. It was under nearly every stone in the beech woods which for a mile or so bordered the road.

The list subjoined includes 35 species and 12 varieties, a small contribution towards a Denbighshire county fauna. I am rather surprised that in a limestone district like that round Llandudno I did not meet with more forms. I had quite anticipated finding such things as *Helix ericetorum*, *H. lapicida*, *H. arbustorum*, *Clausilia laminata*, and *Cochlicopa tridens*. Nor did I meet with any of the *Vertigos*, nor *Zonites fulvus* and *Vitrina pellucida* in the woods. Then again, *Helix fusca*, which in some parts of Wales is extremely abundant, did not fall to my lot. Possibly they, or some of them, will reward the research of a more experienced collector. I now give the detailed list:—

Sphærium lacustre. In a pond at the foot of Deganwy Hill, 1877; common in a pond in Abbey-road, near Llandudno, in company with *Limnæa peregra* and *Physa hypnorum*.

Physa hypnorum. Pond in Abbey-road, near Llandudno, plentiful.

Limnæa peregra. Common in ponds and roadside puddles (with *Succinea putris*) on the flat lands between the two Orme's Heads, and at Eglwys Rhos; also in a new water trough on the summit of the Great Orme's Head (300 ft.), and in ponds at the foot of Deganwy Hill.

Arion ater. Very abundant; Bodscallan, Llangwystenin, &c.

A. ater var. **rufa.** One in a boggy pasture at Bodscallan, of a light brown colour, with head black and and the margin of the foot yellow with the transverse streaks brown.

A. hortensis. A few specimens in Bodscallan and Gloddaeth woods, and at Llandrillo-yn-Rhos.

Limax arborum. Abundant in the beech woods by the roadsides two miles north of Llanrwst.

L. maximus var. **cellaria.** A few at Tal-y-Cafn, and one at Llangwystenin.

L. agrestis. Common; Little Orme's Head, Llangwystenin, Llandrillo, Tal-y-Cafn, Bodscallan, Eglwys Rhos, &c.

Succinea putris. A few in Gloddaeth woods, by stream-sides, and plenty in a wet pasture near Bodscallan.

S. elegans. Common in wet places by the roadsides between Llandudno and Eglwys Rhos.

Zonites cellarius. Common in many places; Gloddaeth woods, summit of Little Orme's Head, Bodscallan, Llangwystenin, Llandrillo-yu-Rhos, Tal-y-Cafn, and Llanrwst.

Z. alliarius. In several places; summits of the Great and Little Orme's Heads, and of Gloddaeth mountain, also at

Bodscallan, Rhos Fynach, and Tal-y-Cafn; and in 1877 at Tan r allt.

Z. glaber. Common in many places; Gloddaeth woods, Eglwys Rhos, foot of Little Orme's Head, Llangwystenin, Llandrillo, Tal-y-Cafn, and Llanrwst.

Z. nitidulus. A few specimens found at Bodscallan, Gloddaeth woods, and Llandrillo, and plenty at the foot of the cliffs of the Little Orme's Head.

Z. crystallinus. A few in the woods at Bodscallan.

Helix aspersa. Abundant everywhere in the Llandudno peninsula, also at Llandrillo, Llangwystenin, and Rhos Fynach, and about Tal-y-Cafn.

H. aspersa var. **minor.** Some of the specimens from Eglwys Rhos are of this form.

H. nemoralis. Abundant by roadsides among thistles and on posts in the flat lands between Llandudno and Gloddaeth, also in various other places. I give a table showing the relative numbers of the individuals appertaining to the different variations of colour and banding. To understand the column headed 'Band-formula' it is only necessary to bear in mind that the normal number of bands is five, and that each is constant in its position and may be designated by a number when present, and by a cypher when absent; also that when two bands are present and fused together, that their numbers are placed between parentheses ( ); and that when any band is nearly obsolete or reduced to a fine line it is denoted by a small figure instead of a large one. It will be noticed on reference to the table that two of my specimens are seven-banded and six-banded, resulting from the presence of additional bands supplementary to (or split off from) the usual third band.

Name of Colour Variety.	Band-formula.	Locality	No. of specimens.
libellula	00_33_345	Llandudno Morfa	1
do.	$1_23_3(45)$	do. ...	1
do.	12345	do.	10
do.	do.	Llangwystenin ...	2
do.	do.	Llandrillo-yn-Rhos	1
* do.	do.	Llandudno Morfa ...	2
do.	123(45)	do.	1
* do.	do.	do. ...	1
do.	(12)3(45)	do.	2
* do.	1(23)45	do. ...	1
do.	(123)(45)	Gloddaeth	1
do.	$1_23$45	Llandudno Morfa ...	1
do.	00345	do.	5
do.	00_345	Foot of Little Orme's Head	1
do.	00_34_0	Llandudno Morfa	1
do.	00300	do. ...	1
* do.	do.	do.	1
castanea	00000	do. ...	22
do.	do.	Gloddaeth	1
do.	do.	Near foot of Little Orme's Head	1
rubella	do.	Llangwystenin	1
do.	00300	Tal-y-Cafn	1
do.	do.	Llandudno Morfa	6
do.	do.	Foot of Little Orme's Head	1
do.	do.	Gloddaeth Mountain ...	1
do.	00_34_0	Llandudno Morfa	1
do.	00345	Gloddaeth	1
do.	003(45)	Llandudno Morfa	1
do.	12345	do. ...	5
do.	do.	Rhos Fynach	1
do.	do.	Gloddaeth	2
do.	(12)345	Llangwystenin	1
do.	123(45)	Llandudno Morfa ...	4
do.	(12)3(45)	do.	1
do.	1(23)(45)	do. ..	2
do.	(123)(45)	do.	1
		Total specimens examined	87

* The specimens marked with the asterisk have the bands transparent and very pale brown in colour.

An examination of this schedule shows that the unicolorous or bandless form of var. *castanea* was much the most numerous, and next to it the five-banded form of var. *libellula*.

Helix rufescens. One found at Rhos Fynach.

H. concinna. Not uncommon; found on the summit and at the foot of the Little Orme's Head, and at Llandrillo.

H. concinna var. **albida.** One on the summit of the Little Orme's Head.

H. hispida. Common by roadsides at Llandudno and Eglwys Rhos, in Gloddaeth woods and on the top of Gloddaeth mountain, in Bodscallan woods, at the foot of the Little Orme's Head, at Llangwystenin, Llandrillo, and Rhos Bay.

H. hispida var. **subrufa.** Common at Eglwys Rhos.

H. hispida var. **albida.** One at Eglwys Rhos.

H. sericea. Common at Eglwys Rhos, and in Bodscallan and Gloddaeth woods, also on a wall at Tywyn.

H. sericea var. **albida.** One in Gloddaeth woods.

H. virgata. Abundant everywhere on the Llandudno peninsula; swarms, with *Bulimus acutus*, on the short turf by the sea, also of a larger size on thistles further inland, and ascends to the tops of all the hills; also at Llandrillo and Llangwystenin. Varies as usual, but to the first glance there are two main forms, the one with black bands, the other almost uniformly white or light-coloured.

H. caperata. Also everywhere and common, but not so abundant as the last. Also at Llandrillo, Rhos Fynach, Llangwystenin, and one at Llanrwst.

H. caperata var. **ornata.** With the type, Great Orme's Head.

H. rotundata. Another species which occurs commonly and everywhere on the peninsula, also at Llangwystenin, Llandrillo, Bodscallan, Tal-y-Cafn, and Llanrwst.

H. rupestris. Common on the limestone rocks of the summits of the Great Orme's Head and Gloddaeth mountain, and a few found on a limy wall near Bodscallan.

H. pygmæa. One in the woods at Bodscallan.

H. pulchella. One on a wall at Tywyn and one on the summit of the Great Orme's Head ; common on an old wall at Bodscallan composed largely of mortar.

H. pulchella var. **costata.** With the type at Bodscallan, plentiful.

Bulimus acutus. Very abundant with *Helix virgata* on the short turf bordering Llandudno Bay. A few also occur on wood posts some distance inland in Llandudno town, and I was somewhat surprised to find it common on the summit of the Little Orme's Head, as I had always understood it was only to be found close to the sea.

B. acutus var. **strigata.** Llandudno Bay, with the type.

B. obscurus. Several specimens at Eglwys Rhos, Bodscallan, Gloddaeth woods, Gloddaeth mountain top, and Llandrillo.

Pupa umbilicata. Another species abundant everywhere on the peninsula, Great and Little Orme's Heads, Gloddaeth mountain and woods, Tywyn, Eglwys Rhos, Bodscallan, Llangwystenin, and Llandrillo.

P. umbilicata var. **edentula.** With the type on walls near Bodscallan.

Balea perversa. A few on the wall at Bodscallan.

Clausilia rugosa. A common species. Great Orme's Head, Little Orme's Head, Eglwys Rhos, Gloddaeth woods, Bodscallan, Llangwystenin, and Llandrillo.

Cochlicopa lubrica. Common in Gloddaeth woods, and occurs in greater or less numbers on the Great and Little Orme's Heads, Eglwys Rhos, Bodscallan, Llangwystenin and Llandrillo, Rhos Bay, Tal-y-Cafn and Llanrwst.

C. lubrica var. **lubricoides.** One at foot of Little Orme's Head, and one at Llanrwst.

C. lubrica var. **hyalina.** In 1877 I took one of this form at Tan r allt near the foot of Gloddaeth mountain.

Carychium minimum. A few in the woods at Bodscallan.

Cyclostoma elegans. Common in the woods at Gloddaeth. In 1877 it was common in the 'Happy Valley' on the Great Orme's Head, but in 1883 I failed to find a single specimen there.

The list thus includes 35 species and 15 varieties as a contribution towards the Denbighshire shell-list.

Helix villosa Drap. **as a British species.**—I do not consider that this shell should be on the British list at all, as I think that the three or four specimens found on the moor at Cardiff are the only ones that have been found alive. Mr. T. Rogers and I went down to Cardiff the autumn after they were found and searched well for them, but could not find any, but found the exact place where they had been picked up. They had evidently been brought over with ballast, as the moor at Cardiff is the place where all the ballast is put. I have since corresponded with Mr. F. Wotton of Cardiff, and he has seen nothing of it, but he has found living specimens of *S. carthaginiensis*, along with dead shells of the same species, and also *H. lactea*. Evidently new species discovered at Cardiff are not to be relied upon as British shells.—E. COLLIER, Manchester.

Paludina contecta in Yorkshire.—This fine species has been recorded from the immediate vicinity of York, but is now extinct in this locality. During 1883, my friends Mr. W. D. Roebuck and Mr. W. E. Clarke found a dead shell in Yorkshire, but near to the borders of Lincolnshire. At Askern, a dwarf form in a subfossil state is occasionally turned up along with the soil by the moles. During June, 1884, I found several living specimens in a small tributary of the Derwent between Breighton and Wressle, which again firmly establishes it in the Yorkshire fauna.—WM. NELSON.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting

HELD MAY 1ST, 1884.

Mr. Thos. W. Bell presided.

NEW MEMBERS.

Messrs. James Madison, E. J. Elliott, and Mrs. Skilton were elected members of the Society.

PAPER READ.

"A List of Land and Freshwater Shells of Peterborough and district," by Mr. A. W. Nicholls.

SPECIMENS EXHIBITED.

The Chairman showed a number of fossil land and freshwater shells from the tertiaries of the Isle of Wight which had been collected by Mr. C. Ashford. Amongst them were specimens of *Helix occlusa*, *H. Vectensis*, *Paludina angulosa*, *Planorbis discus*, *Limnæa fusiformis*, and others; also several species of recent shells from Knottingley and other places.

On behalf of Mr. W. Nelson was shown a small series of fossil marine shells, also from the tertiary beds of the Isle of Wight.

Meeting

HELD MAY 29TH, 1884.

Mr. W. Denison Roebuck, F.L.S., in the chair.

DONATIONS.

The following donations were announced as having been received since the last meeting:—

"Journal of the Royal Society of New South Wales."
"Proceedings of the Linnean Society of New South Wales."
"Transactions of the Yorkshire Naturalists' Union, part vii."

NEW MEMBER.

Mr. Bostock, of the Radfords, Stone, Staffordshire, was nominated.

SPECIMENS EXHIBITED.

The Chairman showed some specimens of *Testacella haliotidea* var. *scutulum* which Mr. R. A. Rolfe had found in his garden at Kew, Surrey, and which had been sent by Mr. C. T. Musson, who stated that Mr. Rolfe had several times seen an odd specimen in the garden, and that, setting to work one evening, he dug up six in about a square yard of ground. They also occur in the Royal Botanical Gardens at Kew. With these specimens was sent another (also exhibited) which Mr. Rolfe had found in 1878 at Welbeck Abbey, Nottinghamshire. This last specimen was much larger than the Kew specimens, some of the latter, however, being quite juvenile examples.

The chairman also mentioned that Mr. W. B. Waterfall, of Bristol, had sent him a collection of slugs from that place, which among others included a large number of *Amalia marginata*; also that Mr. W. Baillie had sent an extensive consignment from the Dunbeath River, Caithness, including *Limax lævis* and numerous examples of *L. arborum*, besides the commoner species.

At a committee meeting held on the 19th June it was decided that the meetings should henceforth be held in the Leeds Mechanics' Institution, on the first Thursday of each month.

Bulimus acutus var. **elongata** Cr. and Jan. **in England.**—Among some *Bulimus acutus* collected at the Needles, Isle of Wight, and kindly sent me by Mr. E. Westlake, F.G.S., of Fordingbridge, were several of this variety, which is distinguished from the type by its more slender form. Dr. Jeffreys in his excellent work gives the average dimensions of the typical form as 15 mill. long and 5 mill. in diameter. The measurement of these specimens is 22 mill. in length by 5 in diameter.—J. W. TAYLOR, March, 1884.

Planorbis dilatatus Gould.—I see in the Conchological Society's list of British shells that this species has been put in brackets, but I think it may be put down as a naturalized British species. I think the theory of my friend Mr. T. Rogers, who first discovered this species, is very likely to be the true one, as one can readily think it must have been introduced from America in cotton. I have not tried for some years to get it at Pendleton, where Mr. Rogers first found it, as the last time I was there they had been repairing the towing-path side of the canal, and had put down a large quantity of new stones at the place where *P. dilatatus* used to be found, and also the water had become much worse, so much so that *S. ovale*, which used to be found there in plenty, had all died away. The other locality at Gorton where Mr. Rogers found it, I have got them at repeatedly—some last season (1883), but not in any great quantity. Mr. Rogers found them close to Ryland's mill at Gorton, near where the warm water from the mill ran into the canal, but now we do not find them there at all, but about a quarter of a mile away where the water is quite cold; I think therefore we may conclude that they are fully naturalized, as it is now fourteen years since Mr. Rogers first found them.—E. COLLIER, Manchester.

Arion ater var. **bicolor in West Gloucestershire.**—On the 12th of May Mr. E. J. Elliott sent me, along with a number of specimens of *Zonites nitidus* from Brimscombe near Stroud, in the Western division of Gloucestershire, several immature scarcely half grown examples of the var. *bicolor* of *Arion ater*, fairly characteristic, although hardly so brilliantly coloured as the Irish ones I have previously had. It is interesting to note that in both instances the locality which produced this variety was a boggy or wet place. Mr Elliott found it with *Z. nitidus* in marshy spots, generally concealed among the wet mosses.—W. DENISON ROEBUCK, Leeds, May 18th, 1884.

BIBLIOGRAPHY.

Die Binnen mollusken der Nordlich gemassigten Lander von Europa und Asien, und der Arktischen Lander, von H. Jordan. Engelman, Leipzig, 1883, 20/-.

This is a reprint from the "Transactions" of the German Academy of Naturalists of an elaborate Treatise on the Distribution in the Northern part of the Old World of Land and Freshwater Mollusca. Originally meant to be a short paper on the mode of life and occurrence of European, and particularly of German, species, the essay grew under the author's hand into the present more important work.

Referring to the similarity of the faunas of Iceland, Shetland, and Faroe with those of Britain and Europe, and the large divergence between those of the Atlantic Islands and those of the nearest parts of the old continent, the author submits his task to the climatic and geographical relations of geological times.

While marine depths of 4,000 metres isolate the Azores and Madeira, shallows not exceeding 700 metres in depth imply, at any rate, a not distant connection between Europe, Britain, the Western Islands, and Greenland,—an association which becomes more certain when the geologist exhibits Miocene Flora of remarkable uniformity extending over the whole northern hemisphere in temperate and higher altitudes.

The author restricts his labour, however, to the actual distribution of now-living mollusca. He adopts (so far as concerns particularly European ranges) an Arctic province extending from the pole to from 60° to 64° north latitude, (continued eastwards to Siberia and Kamschatha and America and Greenland), and a palæ-arctic province, characterised by forest growths, extending southwards to the line of the African desert, and in Asia to the high lands of the Hindukush and Mantchuria.

This second province comprises :—

I. The Germanic regions extending from the Arctic province to the line of the Pyrenees, Cevennes, the Alps, and the Caucasus; though these mountains seem rather an intercalated territory between the Germanic and Mediterranean regions, than only a common frontier.

II. The regions of the Mediterranean Lands, comprising all the countries along either coast of the Great Sea and the Black Sea, and with Syria, Mesopotamia, and Persia.

III. The Atlantic Islands, Azores, Madeira, the Canary Islands, the Cape Verde, with perhaps St. Helena.

As regards both plants and animals, the temperate influence of warmer currents of water and air from the south-west, affects faunal conditions far into the interior of the continent.

The author discusses at length the commonly-held theory that land-mollusca flourish especially in calcareous districts for the sake of material for their shells, and comes to the conclusion that land snails prefer, though they do not absolutely require, "uniform, moderate moisture in the ground, without superficial lodgment of water, free access of air and sun, with enough of warm, shady crevices for retreat, and a sufficiency of deeper and easily accessible places for hibernation." The fruitfulness of limestone districts to the snail hunter probably arises from their yielding these favourable conditions most abundantly.

Land mollusca are like plants in their small power of locomotion, and like plants are apt to follow local conditions of habitat and development, depending rather on physical peculiarities of the surface than on the chemical nature of the soil, although a sea-shore soil and its plants have their own fauna.

A careful disquisition follows upon the occurrence of mollusca in waters of different elevations and different degrees of motion, and (curiously enough) of different masses of fluids, details and observations which the continental naturalist finds more easily than his British colleague, and the latter will find much interesting matter in this chapter.

The third section of the work is devoted to detailed treatment of particular distribution, and is full of very valuable notices, and indications for further research and generalization. It shows, besides a comprehensive selection of such notices for the old continent, a compendium of the observations of North American observers as to the forms which are common over the whole arctic province, or which are representative in the two hemispheres, or which appear to have passed with emigrants to the new world.

The Germanic regions and those called the North Russian and Siberian, and the Celtic (N.W. France, Britain, and Ireland), receive full attention. There follows an interesting disquisition on the mollusca which occur in the higher mountain districts, the Pyrenees, the Alps, the Carpathians, and the Caucasus, full notes on the region of the Mediterranean and a too short section on the mollusca of the province of tropical Asia.

The book concludes with a useful list of books and papers referred to, eight plates illustrating variations in the forms of Unios, and a table of species and occurrence. This table is in itself a very remarkable contribution to the subject. Enumerating 739 species (with the addition of 13 more to the end of 1882) it gives, in 14 large sheets, notes of the occurrence in no less than 88 (larger or smaller) districts. In this list the author has noted his facts up to, apparently, the last mentioned date. Such a table, as indeed the essay itself, is of a kind that must necessarily soon require supplementing, and no doubt correction; but the value of such a work is great and well worth the labour spent upon it, or in mastering its details, and one can well sympathize with Herr Jordan's modest satisfaction in seeing it in print.

The book will for many years be at once a store-house and a platform in this department; to which every student must have recourse, and on which many observers will arrange their new facts, and will not soon be superseded by a better.—R. D. D.

Structural and Systematic Conchology: an introduction to the study of the mollusca, by Geo. W. Tryon, Jun., Conservator of the Conchological Section of the Academy of Natural Sciences of Philadelphia.

This large and important work is based upon the excellent Manual of S. P. Woodward, and is uniform with, and intended as an introduction to the author's larger work, the "Manual of Conchology," now in process of publication.

Mr. Tryon who is well known for his great knowledge of systematic conchology, shows his skill in the treatment and arrangement of the different groups treated of.

The broad facts of the science, the knowledge of which are necessary for the young student, are given with commendable clearness and conciseness.

The author commences his work by giving the classification of the entire animal kingdom, especially dwelling upon the peculiarities of second group—Malacozoa. This is divided broadly into the Acephala and Encephala (the latter group is divided into four classes—the Cephalopoda or cuttle fishes, the Pteropoda of which the genus Clio is an example, the Gastropoda or snails, and the Scaphopoda or Solenoconcha the Dentalia or tooth shells. The Molluscoidea are divided into Brachiopoda, Tunicata, and Bryozoa. Under the head 'Anatomy,' the external features, the skin, the shell, the operculum, the cartilages, the organs of motion, the nervous system, &c. are treated in a very full and elaborate manner, conveying not only the general characteristic peculiarities under each head, but many of the special ones peculiar to particular species.

The habits and economy are next considered. Under this heading the parasites, enemies, the mimicry, &c., are detailed.

The geographical distribution is fully given; the provinces are practically adopted from Woodward, and a similar map, but of larger size, still further shows the range of the different genera.

The bathymetrical distribution of the marine mollusca has a chapter devoted to it, and much valuable specific information is given on the subject.

The distribution in time is given very fully, and a very valuable table is given correlating the beds and deposits of Europe and America.

The work is profusely illustrated. The first volume in addition to giving all the general considerations also furnishes a classified list of the genera and hints on collecting, the twenty-two plates being devoted to elucidating the structure of the various groups. The second volume includes the study of the Cephalopods, Pteropods, and a portion of the Gastropoda, and is illustrated by sixty-nine plates showing the type species of the different genera. The third and concluding volume contains 454 pages and forty-seven plates, and is devoted to the Pulmonata, Scaphopoda, and Pelecypoda, and concludes with the Molluscoidea.

The whole work is very carefully and amply illustrated, the number of figures reaching 3500. The work is published with coloured plates at £6 10s.; with plain plates at £4 0s.; or in a cheaper form with plates printed both sides and bound in one volume, at £2 8s., and may be obtained of Trübner & Co., Ludgate Hill, London, or direct from the author Mr. G. W. Tryon, Academy of Sciences, Philadelphia, U.S.

J.W.T.

Limax maximus v. Ferrussaci in County Antrim.—Through the kindness of Mr. S. A. Stewart of Belfast, I have been favoured with a fine full-grown specimen of this variety—very characteristically marked, and the first I have ever seen of it. It was found in Colin Glen, County Antrim, five miles from Belfast, and with it were *Arion ater* var. *nigrescens*, a very young specimen, and *Limax agrestis* var. *sylvatica*, both of which Mr. Stewart sent to me.—W. Denison Roebuck, Leeds, June 30th, 1884.

Zonites radiatulus var. **viridescenti-alba.**—Yorkshire appears to be very fortunate in the possession of habitats for this rare variety, Mr. J. Whitwham having found it near Huddersfield, and Mr. Wm. West at Shipley Glen near Bradford. I am enabled to add Crossgates, near Leeds, where I found a specimen during January of the present year.—WM. NELSON, June, 1884.

New variety of Limax flavus.—This species appears—so far as my observation goes—to be more constant in its colour and markings than other slugs, for until now I have not seen any more variation than in the intensity of the yellow ground colour in adult individuals, and the preponderance of the dark markings which often obtains in very young examples. The range of this variation in the intensity of the yellow colour has never seemed to me to be worthy of any varietal names. I have however just received from Mr. C. J. Waterfall, of Bath, a couple of examples of the species found at that place, on the Great Oolite, at an altitude of 400 feet. One of these was typical, the yellow being more intense than usual; the other was utterly devoid of yellow, the colour being a semi-transparent grey, not unlike some of the more opaque examples of *Limax arborum*. The markings and the blue tentacles were however sufficient to identify the species. I propose to characterize a new variety for this specimen, and to call it

var. **grisea** agreeing with the type in every respect but ground-colour, which is grey, utterly devoid of any trace of yellow; slime colourless.

Along with these Mr. Waterfall sent me some small examples of typical *Limax agrestis* and numerous adults of the var. *sylvatica*, with the markings pale; a small orange-footed *Arion hortensis* var. *fasciata*; and a full-grown light chocolate-coloured *Arion ater* var. *rufa*; and a number of Helices and Zonites.—WM. DENISON ROEBUCK, Leeds, June 14th, 1884.

Unusually large Unio pictorum (L.).—Mr. W. Gain of Tuxford, Newark, has very kindly sent me some of the largest specimens of this species I have ever seen, which were collected by himself in Ossington Lake, Notts. The specimens measure about 124 mill. in breadth and 55 mill. from beaks to front margin. This is sensibly larger than the extraordinary size attained by those found by Mr. Norman at Fleckney and Wistow in Leicestershire, and quoted by Dr. Jeffreys in his excellent work, the dimensions of which were 117½ mill. broad and 55 mill. in length.—J. W. TAYLOR, Leeds.

Arion ater var. **albolateralis in Sussex.**—Mr. W. Jeffrey of Ratham has very kindly sent me specimens of this handsome variety from Singleton near Chichester. Though not so sharply contrasted in colour as the specimens from Mr. Ashford's original locality in North Wales, they were strikingly different from the ordinary form of the species.—J. W. TAYLOR, Leeds.

Planorbis contortus v. **albida at York.**—Amongst a collection of shells made at York in 1865 by Mr. Whitwell of Skipton, and which I have had the privilege of examining, I detected this scarce variety. The precise locality is given as "ditch near the Ouse, below York." This is the second Yorkshire station known to present time.—J. W. TAYLOR, June 29th, 1884.

Clausilia rugosa var. **albinos in South Hants.**—Mr. Chas. Ashford informs me that a specimen of this rare variety has been recently found in a garden at Christchurch, by Mr. J. H. Ashford.—J. W. TAYLOR, Leeds.

LAND AND FRESHWATER SHELLS OF CAITHNESS.

By C. W. PEACH, of Wick.

[Read before the Royal Physical Society of Edinburgh, March 26th, 1864.]

In 1861 Mr. A. G. More, of Bembridge, in the Isle of Wight, informed me that he was collecting materials for illustrating the British Land and Freshwater Mollusca, according to the method employed by Mr. H. C. Watson in his 'Cybele Britannica,' and asking for information about Caithness, it being included in his Province 17. He was then 'only able to enter a single shell, *Alasmodon margaritifera*.' Although I had then paid very little attention to the subject I had picked up a few specimens whenever they came in my way, and put them away for those who might want them. At once I turned over my hoards and made out a list. Not contented with merely sending this I forwarded many of the shells, and thus instead of 'only *one*,' he had seventeen to place in his 'Province 17.' I have continued to gather, and now, as may be seen by the accompanying list, we have *thirty* species. In order that I might speak with certainty, I have asked authorities to examine all the specimens for me. Foremost, J. G. Jeffreys, Esq., of London, the author of the valuable work used to name and arrange the list by, has seen the shells; the Rev. Mr. Norman the slugs. Mr. More has also seen many of the shells. I feel under great obligations for their prompt and kind assistance. With the exception of *Helix ericetorum*, I have found all in the parish of Wick, [and] many of them have been found as well in different parts of the county. My examination has not been a very strict one, nor very extended, for a great part of the county I have never been in, especially inland, where additions may be most expected. The last summer I added two species of freshwater shells to the list, and as well confirmed three or four others of which I had before only doubtful specimens. I have hopes of assistance from others, for Miss Gunn of Reisgill, Mr. Shearer of Ulbster, and Mr. Anderson of the John O'Groat

Journal here, have entered on the pursuit successfully; and, although at present they have added no new species, they have greatly assisted in extending localities, and from their quick observation I have great hopes. At present, until more facts have been collected, it is not desirable to enter on a comparison of this district with others, nor anything else beyond giving the numbers stated in three local lists which I have. First, Mr. Alder's 'Catalogue of Northumberland and Durham'; that of Aberdeen, by the late Professor Macgillivray, in the work on 'Dee Side'; and that of the 'Province of Moray,' by the Rev. Dr. Gordon, published in the 'Zoologist.'

Northumberland and Durham	80 species.
Aberdeen	53 ,,
Province of Moray	46 ,,
Caithness	30 ,,

I would here remark that when the well-known fact of the diminution [in number] of the Pulmonifera as we proceed north is taken into consideration, with the little examination made, and the small area included in the list—viz., Caithness only—there is little cause for either surprise or dissatisfaction, and it only requires more eyes and willing hands of the lovers of Carnabia to be set in motion to increase the number for a supplementary list. When this is the case I hope to return to the subject, for the present be pleased to accept of this as an instalment only.

LIST

Arranged and named agreeably to the 'British Conchology' of J. G. Jeffreys, Esq., Vol. I., 1862 :—

Sphærium corneum.—Brickigo, River of Wick, &c.

Pisidium nitidum.—River of Wick, and Loch of Sarclet.

Unio margaritifera.—River of Wick, rather plentiful.

***Valvata piscinalis.**—Loch of Brickigo, and River of Wick.

***Planorbis nautileus.**—Reiss, and near the Mill of Thrumster.

***P. albus.**—Very rare, Loch of Brickigo.

P. glaber.—Reiss, and near the Mill of Thrumster. Mr. Jeffreys says:—"These are finer than usual, indeed very nearly as large as some Mr. Bridgman found near Norwich."

P. spirorbis.—Same localities as the last. Jeffreys records it as "from the Moray Firth district to the Channel Islands."

***P. contortus.**—River of Wick and Loch of Brickigo.

***Limnæa peregra.**—Wick, Ulbster, &c.

L. truncatulus.—Southhead, Wick, &c.

Ancylus fluviatilis.—Plentiful in many localities. Jeffreys says, 'Everywhere from Aberdeenshire to the Channel Isles.' I got this fine under similar circumstances that Mr. Jeffreys did at Swansea, 'in an old quarry into which no stream flows,' at Reiss.

Arion ater.—In many localities.

A. hortensis.—A pest especially in gardens.

Limax flavus.—Several places.

L. agrestis.—Another pest in fields, &c. I got also a very dark one, hitherto considered a variety of the above, now *L. parvulus* of Normand, a French conchologist.

Succinea elegans.—In several places, but far from common.

Vitrina pellucida.—In many localities.

Zonites cellarius.—As the above.

Z. alliarius.—Generally diffused, has a strong garlic-like smell.

Z. nitidulus.—Wick, rare; Jeffreys' range, 'Moray district to Guernsey.'

Z. crystallinus.—Whaligo, Wick, and Fenwick. Jeffreys's range as above.

Helix nemoralis var. **hortensis.**—In several localities, generally on the sea coast.

H. arbustorum.—On sandbanks between Castlehill and Murkle, and on the links at Reay. Jeffreys says, 'Apparently not ranging further north than the Hebrides.'

H. rotundata.—Several places.

Pupa umbilicata.—As the above.

Clausilia rugosa.—In the cliffs on the sea coast, near Girnigo Castle, Southend, Wick, and old limekiln near Hemprigs.

Cochlicopa lubrica.—In several places.

So far the list for Caithness. I am, however, desirous of adding two shells found by me in SUTHERLANDSHIRE, believing they are of sufficient interest to be noticed here.

Helix rupestris.—On limestone rocks at Durness, in August, 1857. Rare. Fleming mentions it as a Scotch species.

Bulimus acutus.—Sandhills at Auldshore Beg, near Cape Wrath, July, 1861, and at Durness, August, 1857, associated with *Helix ericetorum*. It is strange not to find it with the above shell in Caithness. Dr. Gordon says [of *B. acutus*] 'Collected in Caithness, and found in rather a suspicious locality, on a mantelpiece, and had been presented to the Rev. J. Leslie, of Burghead.'

N.B.—Those marked with an asterisk (*) have also been found in the marls of Caithness.

[The above seems hitherto to have been published in a newspaper only, and we consequently think it desirable to reprint the paper verbatim.—ED.]

Planorbis corneus v. albinos in Warwickshire.—This variety, which a few years ago was considered one of our rarest shells, is apparently becoming of more frequent occurrence. Mr. Madison, of Birmingham, has recently found it at King's Norton in Warwickshire. Some fourteen or fifteen years ago a dealer in Aquaria in Birmingham had unknowingly a good number of this variety mixed with the ordinary form amongst his stock, all presumably obtained in the neighbourhood of Birmingham. They were detected by Mr. Nelson, who procured from him a good number of fine specimens.—J. W. TAYLOR, September 9th, 1884.

THE LAND AND FRESHWATER MOLLUSCA OF THE MALTESE ISLANDS.

By CAPT. E. F. BECHER, R.A., F.Z.S.

The number of land and freshwater shells to be found in the Maltese Islands (*i.e.*, Malta, Comino, and Gozo), is small, being not much above forty, but amongst these few there are six of exceptional interest, viz., *H. melitensis* Fér., *H. Spratti* Pfeiffer, *Clausilia scalaris* Pfeiffer, *C. mamotica* Gulia, *Physa melitensis* Ben., *Paludina melitensis* Benoit, being peculiar, as far as is at present known, to the group.

A list of the Maltese mollusca was published by Caruana, in 1867, this is 'Enumeratio ordinata Molluscorum Gaulo-Melitensium of the late Guiseppe Mamo,' it is only now to be found in the libraries. Major Feilden has also published an article on the land and freshwater mollusca of the Maltese group, in the 'Zoologist' of May, 1879; this is to be found at Malta, in the bound-up volumes of the 'Zoologist' in the Garrison Library at Valletta. There is a Catalogue of the Land and Freshwater Shells of Sicily, by L. Benoit, and one of the neighbourhood of Palermo, by P. Calcara; I was enabled to peruse these two lists by the courtesy of Dr. Gulia, Professor of Natural History at the Valletta University. Issel in 1868 published 'Dei Molluschi terestri e d'acqua dolce racolti nello Archipelago di Malta,' this I have not seen.

In Malta there are the following collections of local land and freshwater shells:—in the Valletta University Museum, Maltese, moderate, Sicilian, good; in the Public Library, Maltese, bad.

I have found all the species mentioned in Caruana's list except *H. turrita* Phil., which is noted as very rare; *H. neritoides* Gualtieri; *Pupa polyodon* Drap., also said to be very rare; *Turbo conoidea* Broc., which Mamo states he has never observed; *Cyclostoma pygmæa* Michaud (the locality given is

on the rocks near the Salines); and *Limnæa peregra* Müll. He gives two species of Paludinæ—*P. thermalis* Lin., and *P. sp.* (*?*). I have only found one species—*P. melitensis* Benoit.

I have found all mentioned in Major Feilden's list except *Acicula acicula* Müll., which he says 'is not a common species in Malta; it is found in small numbers in the old line of fortification near Corradino Valletta.' *Marinula forminii* Payr. I will ignore, as Major Feilden only admits it on probation as he believes that the specimens he found were washed up by the sea. In addition to Feilden's list I have found *Zonites crystallinus* Müll., and var. *hydatina* Bourg., *Paludina melitensis* Benoit, and *Pupa avenacea* Brug.

The nearest and most profitable locality to Valletta is Manoel Island, where most species can be found. Melleha Bay is another good locality, and repays a visit.

The omission of *Paludina melitensis* Benoit in Feilden's list seems to be a slip of the pen, as he refers to it in his introductory remarks.

Pisidium pusillum Gmelin.—In Feilden's list this is put down as *P. fontinale? (Cyclas)* Drap. Mr. J. W. Taylor has determined it to be as above. Stagnant water at the Marsa and fountains is given as its habitat. I only found it in a small stream about half-a-mile from Notabile towards Boschetto and in very limited numbers.

Paludina melitensis Benoit.—This minute species is common in most running waters, though not in any numbers, but in a stream at the head of the Grand Harbour (described under *Alexia myosotis*) in myriads. Feilden does not mention this species.

Planorbis sp.—Mr. J. W. Taylor is of opinion that this is a form of *P. glaber* Jeff. It is found in most places where there is running water.

Physa melitensis Mamo.—This species, though awarded specific rank, should, I believe, be more correctly described as *P. acuta* Drap. var. *melitensis*. It is scattered sparsely

in most running water, but most abundantly in a reservoir near a large Plane tree in Floriana Gardens. This tank, during the last winter, was allowed to remain dry, and was re-cemented in the spring; it will thus have to be re-stocked by the supply pipe, and I expect that it will be some little time before the former abundant supply will be equalled. I extract the following from Caruana's Catalogue:—'Note of Mr. Mamo on *P. melitensis*.—This new species of Physa was found by me in the reservoir behind the Plane tree in the Floriana gardens, on the 12th April, 1856. Several individuals, placed in a glass vessel of water, attached themselves to the edge of the same, and two days afterwards deposited a gelatinous crystalline and oblong body of about the same size as the mother mollusc, very transparent, and containing a mass of minute spheroidal and limpid eggs like air bubbles. Each egg had an opaque thin globule on its surface of a bright yellow colour. On the 16th, these globules became discoloured. On the 19th, the posterior part of the globule bent towards the anterior part and took an accelerated and rotary motion inside the egg. On the 30th, some of them separated from the gelatinous mass, which was reduced to a very thin membrane, and floated freely on the surface of the water, showing distinctly the nucleus of the shell, the white body of the animal with its two tentacles, and two very dark eyes.'

Limnæa truncatula Müll. var. Common. In the Wied behind the Lunatic Asylum, after wet, in small hollows, there is usually a little mud and water; here I have found the largest specimens. This wet soon dries up, and in summer the mud must be baked till it becomes almost brick.

Ancylus fluviatilis Drap. Not uncommon on stones in running water, and in drinking troughs. It is found in Sicily.

I did not turn my attention to the slugs. Caruana gives *Limax variegatus* Drap., *L. nigricans* Schultz, and *L. gagates* Drap. Slugs are usually to be seen in damp weather, feeding on human excrement on the road side; another favourite resort is at the mouth of old wells, which are covered over with a door.

Helix aperta Born.—Very common. I have one specimen with a calcareous epiphragm. This is according to Benoit very common everywhere in Sicily.

H. aspersa Müll.—Common. The best localities for obtaining a selection of this shell is the refuse heaps outside villages; the animal being eaten by the Maltese, the empty shells are generally thrown there in quantities. I have taken vars. *exalbida* Menke and *zonata* Moq. Dr. Gulia tells me a black variety is sometimes, but very rarely, found. I presume this is var. *nigrescens* Moq. This is a most common shell in Sicily. Calcara gives ten Sicilian varieties:—1 *testa magna*, 2 *spira depressa*, 3 *anfractibus ventricosis*, 4 *glabra*, 5 *striata*, 6 *tota luteola*, 7 *flava castaneo fusca fasciata*, 8 *castaneo-fusca alboflava fasciata et maculata*, 9 *flavo-luteola castaneo-fasciata fasciis interruptis*, 10 *castanea flavo-lineata.*

H. Schembrii Scacchi=*H. calcarata* Benoit. — Very common and, as Fielden says, liable to be confused with the next species. It has, however, a larger umbilicus and is more strongly striated, as a rule it has a mottled appearance, whereas *H. pyramidata* is generally banded; this species is not, I believe found in Sicily. It is known better locally by the name *calcarata* than *Schembrii.*

H. pyramidata Drap.=*H. rugosiuscula* Calcara. Very common. Feilden mentions that a much larger variety is found on the Islet of Filfla, off Malta. I found this variety on Filfla, and not the main-land type. Filfla is a rock covering about three-eighths of an acre, on it is a little herbage. The specimens of the above, *Bulimus pupa* Linn., and *Clausilia macrostoma* Cant., found on this islet,

are all finer than those on Malta. In Benoit's list it is stated to be very common in Sicily in all dry places; variable in size and colour.

H. Spratti Pfeiffer.=*H. gaulitana* Mamo.=*H. solaroides* Gulia.=*H. Schembrii* Schwarzenburg.—This Helix peculiar to Gozo was first found by Admiral Spratt in 1843; first at Marsa el Forn in Gozo, and afterwards on the General's Rock on the coast of the same island. My specimens were found in the first named locality, where it is plentiful; the larger sized ones are not so frequently met with.

H. meda Porro.—Feilden says, 'this snail is very common on shrubs in the Floriana Gardens,' and as this is its only locality regards it as an importation with foreign plants. This is the only locality in which I found it, and it was not very common. Benoit writes, 'lives near Palermo, Girgenti, and Syracuse.' The shell can be distinguished by its strong striations on the body whorl, it is of a light colour and marked with interrupted narrow dark bands.

H. trochoides Poiret=*H. conica* Drap.—Feilden states that it is very local, the only place where he has found it being at the head of Melleha Bay, where it is found by hundreds attached to the stems of the coarse herbage. He goes on to say that the Maltese specimens are not the typical form. My experience is the same as the above. The shell is white, banded with dark-brown; these bands vary in distinctness to total absence. According to Benoit it is found in Sicily.

H. striata Drap.—Very common. A white variety is also common. It is found in Sicily.

H. candidissima Drap.—Very common, but not universally distributed. I have found it on the coast from St. George's Bay in N.E. direction—to Marfra on Feilden's authority—but I have only personally found it as far as Melleha Bay, not having been further along the coast. As its name implies, the shell is white. It is very subject to distortion, in fact I have rarely, if ever, found a perfectly regularly

formed specimen. To the casual observer it appears sometimes deeply umbilicated and sometimes not. The reason of this is that the inner extremity of the lip is reflected back, covering more or less the umbilicus, which covering is very frequently broken. Benoit mentions several localities in Sicily where it is common.

H. melitensis Fer.—Not uncommon. A light cream-coloured shell with faint dark markings in the direction of the line of growth; sometimes almost absent. Not found in Sicily.

H. vermiculata Linn.—Appears to be as common in Sicily as it is in Malta. It varies considerably in colour; a light-brown variety with few, if any, markings is not uncommon.

H. pisana Müll.—Very common everywhere. There is considerable colour variety. A peculiarity about this species as well as some others, notably *H. cespitum* Müll., is that at the approach of summer, instead of retiring to shady places, they are to be found on exposed twigs, etc., where they are without any shelter from the fierce heat of the sun. As common as the last in Sicily.

H. cespitum Müll.=*H. variabilis* Drap.—Very common, especially along the shore near Marsa Scirocco. Very common in Sicily.

H. conspurcata Drap.—Common, especially on Manoel Island, where they are to be found many together under stones, and in the crevices of the fortifications. It is very common in Sicily.

H. lenticula Fer.—Common in similar localities to the above. Those I have obtained at Malta have all been considerably smaller than my Gibraltar specimens.

H. Erdelii Roth.—This is not a common species. It is named *H. flavida* Ziegl. in the collection at the Valletta University; the shell is somewhat the shape of Zonites, horn colour, semi-transparent, strongly striated along the line of growth.

Zonites cellarius Müll.—Feilden gives this as 'one of the more uncommon land shells,' which is precisely my experience. Some Zonites, very similar to *Z. cellarius* Müll., I submitted to Mr. E. A. Smith, of the British Museum, who kindly examined them and gave his opinion that they were doubtful *cellarius*. Mr. J. W. Taylor was good enough to report on them, and writes : 'I am inclined to consider them *Hyalima aequata* Mousson.

Z. crystallinus Müll.—This species is not mentioned by Feilden. Mr. J. W. Taylor has confirmed my naming. I found in all six specimens, under stones on Manoel Island. I searched for them on many occasions but could find only these six, which were in pairs, and near the new Naval Torpedo Pier. Two I gave to the Valletta University, two to Major Feilden, and two are in my collection. Benoit gives it as abundant near Palermo near Madonie. I have also found a very few var. *hydatina* Rossm. (determined by Mr. J. W. Taylor).

Clausilia syracusana Phil.=*C. macrostoma* Cant.—Very common and universally distributed, except in the area in which *C. scalaris* Pfeiffer abounds. The specimens I found on Filfla have the longitudinal striæ on the last whorl much stronger, and, in fact, are finer than those on the mainland. Benoit states it inhabits the neighbourhood of Syracuse.

C. bidens Linn.=*C. papillaris* Drap.—This prettily-marked Clausilia is not so common as the preceding. Common in Sicily.

C. scalaris Pfeiffer=*C. delicatæ* Gulia=*C. scalaris* Caruana.—Concerning the history of this Clausilia Feilden says, 'It appears to have been first discovered by Admiral Spratt near St. Paul's Bay, and was first described by Pfeiffer, and again by Dr. Gulia.' Its habitat is very restricted, extending from Cala Mistra along the coast to a point where a fault intersects the coast line opposite Selmone Island. Its boundary on the land side is a fault where

the Upper Limestone is faulted against the Calcareous Sandstone. The diagram on accompanying plate, on a scale of about two inches to a mile, will best explain the area. The narrow strait between Selmone Island and the main land is regarded as 'the place where two seas met,' referred to in the Biblical account of St. Paul's shipwreck. The shaded part is the *C. scalaris* area and where the otherwise universally distributed *C. syracusana* is not found. I found the latter very plentiful just the other side of Cala Mistra. As a rule the specimens found are more or less decollated, but a few can be picked up entire. As its name implies it is scalariform, each whorl forming a step.

C. mamotica Gulia.—This is another peculiar Maltese, or more correctly, Gozo Clausilia. It varies considerably in form. I unfortunately was unable to visit the locality named in Feilden's list, viz., the left side of the gorge of Sclendi in Gozo.

Acicula acicula Müll.—I have already made remarks on this species.

Zua follicula Gmelin.—Common under stones, when not too dry. Caruana says, 'especially on the bastion of St. Anne's Gate, Floriana.' There is, however, no need to point out any special locality.

Bulimus decollatus Linn.—Very common everywhere, as also in Sicily.

B. acutus Linn.—Very common everywhere, but the best locality for obtaining well-marked colour varieties is between the head of Melleha Bay and the opposite side of the island, which is very narrow here. I submitted six varieties to Mr. J. W. Taylor, who reports:—'No. 1, var. *strigata* Menke, not characteristic; No. 2 is a link between var. *articulata* Lam. and No. 4; No. 3 is deficient of the usual band, but has the upper or occasional one well marked; it has not yet received a distinctive name; No. 4 is the most striking variety, but has not yet received a

name; it is allied to my var. *nigrescens*, but differs, I think, sufficiently to entitle it to special recognition; No. 5, *bizona* Moq., but has the usual or lower band indistinct; No. 6, var. *articulata* Lam.' Var. *strigata* Menke is an ordinary Maltese type. Calcara mentions it and nine varieties as found in Sicily.

B. pupa Linn.—Common. The specimens I found on Filfla are of larger size than any I ever found on Malta. Benoit gives it as very common in mountainous places of Sicily, and says it varies somewhat in size and dimensions.

Pupa granum Drap.—This species is common especially on Manoel Island, its small size and colour similar to that of the earth might cause it to be overlooked.

P. avenacea Brug.—I found the var. *minor* in the same locality as *P. granum*. The type I did not find, but there are specimens in the Valletta University Museum.

Cyclostoma melitense Sowb.—Common. A variety with a deep lilac-coloured shell and light-coloured bands is not so common. Perhaps this should be rather named *C. elegans* Müll. var. *melitense*, *C. elegans* Müll., according to Benoit, being common all over Sicily. Calcara gives two Sicilian varieties: 1 *albido cinerea*, 2 *idem. rufa violacea fasciata et maculata.*

Alexia myosotis Drap.—Feilden says of this species, 'Common in damp and uncultivated spots near the sea.' This was not my experience at all. Caruana says, 'Common with a biplicated variety; found at the Marsa and on the decaying roots of plants in marshy places at the Saline.' This I think describes better its habitat. I found it in numbers on the stones at the side of a small stream at the head of the Grand Harbour; not the stream from the Marsa, but on the Corradino side of this. Its habits seem semi-aquatic. It is also found at Wied Gineyna.

Specimens of the majority of the above are to be seen in a collection deposited by Major Feilden in the British Museum.

Colonization of Land Shells at Chislehurst.—I have introduced specimens of the following into the Chislehurst district, and it may be well to record this, in case anyone should subsequently find them and imagine them to be true natives of the place :—*Helix pomatia* : four were liberated two years ago, two of which we again found about a month ago. Soon after the finding of these specimens, my brother brought about fifteen specimens from Warlingham and let them go at the same place. *H. arbustorum* : four or five have been liberated with *H. lapicida* and a few others, but as they all occur within a few miles of Chislehurst, this is not of much importance. *Clausilia biplicata*: several specimens from Brussels were liberated last year. *Cl. Rolphii* : I liberated several young ones from near Dorking and Robertsbridge, and at the same time a few *Coch. tridens* and *Helix sericea*, and close by some *H. rupestris*. *H. virgata* : a large number from various localities have been let go, but they do not seem to multiply. *Cyclostoma elegans* : specimens have been let go from various localities. *Clausilia parvula* : I have started a colony of this species with a number of specimens from the Rigi, and with them several *Pupa secale*, and a few young specimens of what appear to be *Helix villosa*, and also young *Pomatias septemspirale* and a *Hyalina*. *Helix cartusiana* : a large number of Sandwich specimens were liberated last year, but they seem to have died out.—T. D. A. COCKERELL, August 29th, 1884.

THE DARTS OF BRITISH HELICIDÆ.

By CHARLES ASHFORD.

PART VI.

14. **Helix pomatia** L., pl. ix., figs. 1—8. DART-SAC stout, subcylindrical or subclavate; coats thick, white or pearl-white at all ages. DART curved, furnished with four equisalient blades having blunt, thickened, smooth margins which end abruptly or even acutely angulated below; base moderately expanded; annulus of about 16 rods. Length 8 to 9½ mm.

The dart-sac of this species (fig. 1) has a general resemblance to that of *H. aspersa* in colour, form, and structure, but is usually less oval in shape and often truncately rounded at the free end. The lower part is, for a short distance, fused to the vagina. Its outer coat is remarkably thick and muscular, well suited to the requirements of the formidable weapon it contains.

On an average, not less than forty little azure-white branches, supported on a short thick pedicle, make up each of the two mucous glands. For their beauty and curious ramification to be thoroughly appreciated they should be isolated and spread out in a little clear water. While resembling in style of subdivision those of our common garden snail they exceed them two-fold in length as well as in number of branches. In the last respect they are extremely variable. I have counted as many as 73 terminals in one gland, and as few as 15 in another adult individual. There exists in *H. pomatia* a peculiar tendency for these branches to assume aberrant forms. Figs. 3, 4, 5, and 6 represent curious malformations met with in about 30 shells collected near Reigate and sent me by Mr. J. E. Daniel, of Epsom. They remind one of the "freaks" in fern-life.

The dart (fig. 2) is strong, smooth and glossy, always curved and quite devoid of mucous films between the blades. It differs from the dart of *H. hortensis*, with which, in style of build, it appears at first glance to have much in common, in being fully twice as long, in having the blade-margins roundly thickened

instead of channelled, and in showing less regularity of convergence from base to point. In some instances the breadth is nearly as great at a point two thirds from the base as at the base itself, and then the intervening boundary lines run nearly parallel or in exceptional cases even concave on both sides. The inferior termination of the blades is quite abrupt, often angled acutely. Amount of curvature and ratio of breadth to length are variable. Schmidt remarks that the two blades in the plane of curvature are broader and sharper in the neighbourhood of the point than the other pair.

Moquin-Tandon, in his figure of the cruciform section, represents the planes of the two pair of blades as obliquely inclined to each other. Though I have broken several darts with the special object of observing this feature, no evident instance of the kind has occurred, and we must therefore conclude the rectangular or nearly rectangular intersection is most common in this country. There is a good engraving on a large scale of part of this dart in Lister's 'Exercitatio Anatomica,' and excellent lithographs will be found in the plate * accompanying some notes on the subject in the 'Malak. Blätt.' for 1850.

Immature darts occur rather frequently. Three forms in as many stages of growth are shown in fig 7 *a*, *b*, *c*, and the base of one still further advanced in fig 8. These may with advantage be compared with corresponding stages in *H. aspersa* represented on a previous plate. Shaft, blades, blade-margins, base, and annulus appear to follow the usual sequence and it is unnecessary to refer to them more in detail.

Cases are on record of lost darts entombed in the viscera of this species. Lister remarks: "Semel ineunte Septembri, duos stimulos unius Cochleæ corpore diu, ut conjicio, quod a venere jam diu destiterant, infixos extraxi." On one occasion in the month of May I found in the sac only the lower half of

* In the British Museum copy this plate is bound up with the volume for 1852.

a dart, attached as usual to the tubercle, the apical half having been lost, probably broken off in conflict.

I have had no opportunity of observing the occurrence of the dart except in May and September, but during those months only one sac was found empty among about three dozen full-grown shells.

Mr. H. P. Fitzgerald has obligingly forwarded examples from the neighbourhood of Basingstoke, N. Hants., and fig. 1 is drawn from one of them. The other figures are from Surrey specimens.

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15. **Helix rufescens** Pennant, pl. ix., figs. 9—12. DART-SACS two in number, one on each side of the vagina, a smaller and empty sac in each case intervening, white, sometimes minutely spotted, slightly transparent. DARTS two, usually more or less curved but often straight; shaft round and smooth, the middle part nearly cylindrical or conspicuously tapering, without blades; base long, largely expanded, often transversely ridged or puckered; annulus absent. Length about 1·25 mm.

We now come to a small group, embracing this and the two following species, characterized by a somewhat more complex organization. They all possess two pair of sacs, of which the inner members are empty, and the outer ones secrete darts (fig. 9). We call to mind the two simple sacs of *H. ericetorum*, each containing a dart, and the single bilobed organ of *H. fusca*, with its one weapon in the outer lobe. The three Helices now coming under notice may be said to exhibit both these peculiarities combined in one arrangement. Several continental species closely allied to one or other of the trio appear to have a similar conformation.

The true dart-sacs of *H. rufescens* are clavate or pyriform and semi-transparent white, the two secondary lobes are rather smaller than the former, but rise higher and are often more opaque. Both are sometimes densely but minutely spotted with brown.

Rather high up are eight mucous glands, or perhaps they should be described as four in number disposed in very deeply divided pairs. They are about 3 mm. long, usually simple, occasionally bifid, rarely trifid, stout and stiff with opaque white or buff cores and supported by short, thin, flexible stalks. Here and there may be noticed a curious stricture as if the branch were tied round tightly with dark brown thread. Though eight is the usual number, seven or nine sometimes occur.

An instance of misgrowth has come under my notice where one dart-bearing sac was properly developed, the other arrested at an early stage. A similar case has already been referred to in *H. ericetorum*.

The twin darts are generally alike but vary in different individuals. Sometimes they are perfectly straight like little circular obelisks, sometimes curved and awl-shaped. There is no appearance of even rudimentary blades. The basal expansion is relatively very large and often asymmetrical with a more or less wrinkled surface and attenuated margin. Figs. 10 and 11 shew the extreme limits of variation among the specimens in my collection. A very common form is intermediate, the shaft but slightly curved and the base apparently set on askew.

I have never found both darts absent from a mature shell, and very rarely even one of the couple. They appear to be retained throughout the winter for they have occurred as uniformly, when sought for, in December, January, and February as in the other months. Perhaps the comparatively large base affording, as it must, a greater area of attachment to the tubercle may partly explain why the weapons are so seldom lost. A noteworthy feature is the position of the dart-sacs which are removed by nearly three times their own length from the external aperture. Are both darts brought into action at once? No one appears to have recorded any observations of the gladiatorial encounters of the smaller species.

An animal dissected in the last week of July was found to have been killed while depositing or about to deposit its eggs.

Seventeen eggs filled the tube from the albumen gland to the outlet. The oviduct was bent into a semicircle by the unequal lateral distension of the two conjoint passages in that part, rendering the distinction between oviduct and sperm-duct very clear; the usual loose interfoldings of the former were quite effaced, and the two dart-sacs were widely separated by the eggs passing between them (fig. 12).

The figures are from specimens collected at Christchurch.

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16. **Helix hispida** L., pl. ix., figs. 13—17. DART-SACS two, each with an accessory lobe like those of *H. rufescens* and similarly situated but smaller; clear white, sometimes minutely dotted with brown. DARTS two, occupying the outer sac of each pair, usually curved and awl-shaped, or more rarely straight; base relatively large; annulus absent. Length about 0·75 mm.

The eight stiff little mucous glands, four on each side or verticillate, with their opaque interiors and contracted exits are much like those last described, but they are perhaps rather longer compared with the size of the animal and less inclined to be flexuous.

So closely are *H. hispida* and *H. rufescens* alike as respects the organs constituting or connected with the reproductive apparatus that it is difficult to point out any distinction, apart from size, between their dart-sacs (cf. Dr. Lehmann in Mal. Blätt., 1869). What slight variations occur in one species, such as the shape of the teliferous sac and its relative proportion in size to the adjacent lobe, appear also in the other (fig. 13).

In both species the darts too run through the same variations—in curvature, breadth of shaft and pose of base—but the perfectly straight, subcylindrical, belemnite form of the upper part occurs less frequently in *H. hispida** (figs. 14, 15).

Twice only have I met with immature darts. These occurred among a considerable number of specimens collected in the month of March near Stockton-on-Tees and favoured by

* Care must be taken in mounting these little objects or they may be fixed in such a position as to seem straight under the lens and yet be really curved.

Mr. B. Hudson, of Middlesbrough. As might be expected the bases were but slightly enlarged (fig. 16).

The occurrence of empty dart-sacs in mature shells is nearly as uncommon as in the case of *H. rufescens* and even in shells not quite completed the darts may occasionally be found. In September, I received a batch of specimens collected near Wakefield and sent by Mr. G. Roberts, but the shells were not fully matured and did not yield a single dart.

The figures are from the Stockton examples referred to above, samples of which have been approved by Dr. Jeffreys.

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17. **Helix concinna** Jeffreys, pl. ix. figs. 18-20. DART-SACS two in number, each bi-lobed and similar to those of *H. hispida*. DARTS two, curved or occasionally straight, like the preceding; annulus absent. Length about 0·75 mm.

After a careful examination of many adult specimens of this and the last species procured from different parts of the country and selected as much as possible from extreme forms of each kind, I have failed to detect any constant difference in either mucous glands, dart-sacs, or darts. Nor is a difference to be expected considering the similarity of the respective organs in *H. rufescens* and *H. hispida*, between which species it is generally agreed *H. concinna* takes a systematic place. According to Schmidt this conformity of darts obtains also among several extra-British members of the European group that clusters round *H. hispida*.

As *H. concinna* of typical form is rather abundant near Christchurch I have had the opportunity of examining an extensive series. The almost constant presence of darts in adult shells, irrespective of the season of the year, is remarkable, and immature darts occur almost as rarely as empty sacs.

Fig 18 is from a Christchurch specimen, verified by Mr. J. W. Taylor, fig 19 from a very characteristic shell taken at St. Alban's by Mr. Hopkinson of Watford, and fig. 20 from another Christchurch specimen kindly identified by Dr. Jeffreys.

LIST OF SHELLS FOUND IN THE NEIGHBOURHOOD OF YEOVIL, N. SOMERSETSHIRE.

By J. PONSONBY.

The Land and Freshwater Shells of Somersetshire have been the subject of many able and exhaustive articles. The following list is purely a local one, all the specimens having been collected by the writer within the limits of a walk from Yeovil. The neighbourhood is tolerably rich in the land shells, considering the very small extent of country investigated. As to the freshwater species, however, we are rather badly off. The Yeo, the only river, is a rapid, and in the summer, a shallow stream; there are apparently no lakes or large ponds where the *Paludinæ*, *Limnæa stagnalis*, &c., are likely to be found, though from other parts of the county these species have been recorded. The conditions also are unfavourable for *Pupa* and *Vertigo*, several other species of both these genera being known from other parts of the county. Unfortunately the bivalves have been much neglected, as no doubt the ponds of the neighbourhood would on investigation yield several additional species. It is hoped that another year will remedy this omission.

Sphærium corneum (L.).
Anodonta cygnæa (L.).
Neritina fluviatilis (L.). River Yeo.
Bythinia tentaculata (L.). Common.
Valvata piscinalis (Müll.). Local.
Planorbis nitidus (Müll.). Local.
P. nautileus (L.).
P. albus Müll.
P. complanatus (L.).
P. contortus (L.).
P. spirorbis Müll.
Physa hypnorum (L.). Local.
P. fontinalis (L.).

Limnæa peregra (Müll.).
L. palustris (Müll.).
L. truncatula (Müll.).
Ancylus fluviatilis Müll.
Succinea putris (L.).
S. elegans Risso.
Vitrina pellucida Müll. Not common.
Zonites cellarius (Müll.).
Z. nitidulus (Drap.).
Z. purus (Alder).
Z. radiatulus (Alder).
Z. nitidus (Müll.).
Z. crystallinus (Müll).
Z. fulvus (Müll.).
Helix aculeata Müll.
H. aspersa Müll.
H. nemoralis L.
H. arbustorum. L. Apparently confined to three localities of *very* small area.
H. rufescens Penn.
H. hispida L.
H. sericea Müll.
H. virgata DaCosta.
H. caperata Mont.
H. ericetorum Müll.
H. rotundata Müll.
H. rupestris Drap.
H. pygmæa Drap.
H. pulchella Müll. Seems to be very scarce.
H. lapicida L. Local.
Bulimus obscurus (Müll.).
Pupa umbilicata Drap.
P. marginata Drap.
Vertigo pygmæa (Drap.).
V. edentula (Drap.).

Balea perversa (L.).
Clausilia rugosa (Drap.).
Cochlicopa lubrica (Müll.).
Achatina acicula (Müll.).
Carychium minimum Müll.
Cyclostoma elegans (Müll.)

AUTHENTICATED LIST OF THE MOLLUSCA OF NORTHAMPTONSHIRE.

The following list is a transcript from the record-books of the Conchological Society, and only includes records which have been authenticated (*i.e.*, verified by the submission of specimens to Mr. J. W. Taylor, one of the Society's referees, and in like manner the slugs have been seen and authenticated by Mr. Wm. Denison Roebuck). These records are therefore uniform in value with the other 'authenticated lists' published or to be published, in so far as the elimination of certain obviously possible sources of error is concerned.

The principal materials upon which the following list is based are :—

(1). A collection of shells made by Mr. Thomas W. Bell, M.C.S., of Leeds, in the immediate neighbourhood of Peterborough, which is in the extreme N.E. corner of the county, in the years 1877, 1880, and 1882.

(2). A few shells collected by the Rev. H. H. Slater, M.A., F.Z.S., &c., at Irchester, on the extreme E. border of the county, in the spring of 1884.

(3). A large collection made within a few miles radius of the town of Northampton, by Mr. W. D. Crick, of that place, during the past two or three years.

(4). A small collection from Castle Ashby and Maidford, got together by Mr. R. Rogers, and submitted to Mr. Taylor by Mr. Crick.

(5). Isolated records from other sources, each of which is duly credited to its recorder.

It will be seen on referring to the map of the county that much the greater part of its area is as yet uninvestigated, for a radius of seven miles from their common centre will cover all the localities investigated by Messrs. Slater, Crick, and Rogers, while a radius of three miles will include all those worked by Mr. Bell, which moreover are on the extreme edge of the narrowest end of Northamptonshire.

The number of species and varieties recorded hereafter are as follows :—

Water Shells	...	30	species and	6	varieties.
Slugs ...	...	4	,,	2	,,
Land Shells	...	37	,,	17	,,
	Total	71		25	

This enumeration does not include the numerous colour and band mutations of *Helix nemoralis* and *H. hortensis*.

The species whose absence from the enumeration is most conspicuous and which are therefore the most likely to be added to it by further research are the following :—

Pisidium, various species	Limax flavus.
Anodonta cygnea.	L. lævis.
Valvata cristata.	Lehmannia arborum.
Physa hypnorum.	Zonites glaber.
Planorbis nitidus.	Z. nitidus.
Ancylus lacustris.	Helix pygmæa.
Amalia marginata.	Vertigo, various species.

The Conchological Society's referees will be happy to have the opportunity of examining and determining any or all of the above. There also seems no reason why *Testacella* should not occur, while *Cyclostoma* has been reported but not confirmed, and *Achatina* and *Acme* should be searched for.

The initials appended to the records are those of T. W. Bell, W. D. Crick, R. Rogers, and H. H. Slater.

LIST.

Sphærium corneum (L.).—Peterborough, Eye, and Newborough, T.W.B.; the Little Sea, Far Cotton, Northampton, five sent, W.D.C.; river Nene at St. James' End meadows, two sent, W.D.C.

Sphærium corneum v. **flavescens** (Macgill.).—Eye, T.W.B.; Irchester, one, H.H.S.; river Nene at St. James' End meadows, with type, W.D.C.

Sphærium rivicola (Leach).—In the canal at Far Cotton, first bridge towards Blisworth, four, W.D.C.

Sphærium lacustre (Müll.).—In river Nene at St. James' End meadows, Northampton, one, W.D.C.; pond at Castle Ashby, on duckweed, two, R.R.

Pisidium pusillum (Gmel.).—Rejectamenta of river Nene, at St. James' End, Northampton, one, W.D.C.; Castle Ashby, on duckweed in a pond, seven, June, 1880, R.R.

Unio tumidus Phil.—River Nene at St. James' End, Northampton, one, W.D.C.; canal near Weeton Station, one, W.D.C.; canal at Far Cotton, W.D.C.

Unio tumidus v. **radiata** Colb.—River Nene between Old Sewage Works and Paper Mills, Northampton, two, W.D.C.

Unio pictorum (L.).—River Nene between Old Sewage Works and Paper Mills, Northampton, three, W.D.C.; Castle Ashby, one, R.R.

Anodonta anatina (L.).—River Nene between Old Sewage Works and Paper Mills, Northampton, canal near Weeton, and canal at Far Cotton, seven, W.D.C.

Anodonta anatina v. **radiata** Jeff.—River Nene between Old Sewage Works and Paper Mills, Northampton, and in canal, Far Cotton, three, with type, W.D.C.

Dreissena polymorpha (Pall.).—Canal, Far Cotton near Northampton, plentiful, W.D.C. Mr. Crick informs us that some three or four years ago the canal was diverted by the railway company, and now the stones forming the sides of the new banks are entirely covered with these shells.

Neritina fluviatilis (L.).—River Nene near Northampton, J. W. Wood; plentiful in the canal at Cotton End, Northampton, W.D.C.

Neritina fluviatilis v. **trifasciata** Colb.—River Nene near Northampton, J. W. Wood.

Paludina contecta (Millet).—Eye and Newborough near Peterborough, plentiful, 1880, T.W.B.; river Nene at Cow Meadow near Northampton, one dead specimen, W.D.C.; ponds at Castle Ashby, two, R.R.

Paludina vivipara (L.).—Canal at Cotton End, Northampton, plentiful, W.D.C.

Bythinia tentaculata (L.). — Peterborough, Newborough, and Eye, T.W.B.; plentiful in the brooks connected with the river Nene near Northampton, W.D.C.

Bythinia Leachii (Shepp.).—Newborough near Peterborough, T.W.B.

Valvata piscinalis (Müll.).—Newborough near Peterborough, T.W.B.

Planorbis nautileus (L.).—Pond at Castle Ashby, two, R.R.

Planorbis albus Müll.—Pond at Castle Ashby, two, with last, R.R.; Peterborough, T.W.B.

Planorbis spirorbis Müll.—Rejectamenta of the river Nene at St. James' End, Northampton, three, W.D.C.

Planorbis vortex (L.).—Peterborough, Eye, and Newborough, T.W.B.; Little Sea, Far Cotton, Northampton, five, W.D.C.

Planorbis carinatus Müll.—River Nene at Northampton, W.D.C.; canal at Far Cotton, four, W.D.C.; Eye and Newborough, T.W.B.

Planorbis complanatus (L.).—Peterborough, Newborough, and Eye, T.W.B.; river Nene at St. James' End, Northampton, two, W.D.C.

Planorbis corneus (L.).—Pond in Hardingstone Fields, Northampton, two, W.D.C.; canal reservoir at Bramston, four, W.D.C.; Peterborough, Eye, and Newborough, T.W.B.

Planorbis contortus (L.).—Peterborough and Eye, T.W.B.; rejectamenta of river Nene at St. James' End, Northampton, one, W.D.C.

Physa fontinalis (L.).—Newborough and Eye, T.W.B.; plentiful after a flood in a pool by the side of the road to Beasley's Mill, St. James' End, Northampton, Feb., 1882, the locality is now destroyed by the filling up of the pool, W.D.C.

Limnæa peregra (Müll.).—Peterborough, Eye, and Newborough, T.W.B.; brook crossing the Kettering Road at Kingsley Park, W.D.C.; Little Sea at Far Cotton, Northampton, three, W.D.C.

Limnæa peregra v. **ovata** Drap.—Canal at Far Cotton, Northampton, five, W.D.C.; canal at Blisworth, two, large examples, W.D.C.; ponds at Castle Ashby, six, R.R.

Limnæa peregra v. **intermedia** Fer.—Peterborough, 1882, T.W.B.

Limnæa auricularia (L.).—Newborough, T.W.B.; canal at Blisworth, two, W.D.C.; canal at Far Cotton, five, W.D.C.

Limnæa stagnalis (L.).—Canal at Blisworth, two, W.D.C.; canal (one) and Little Sea (seven) at Far Cotton, W.D.C.; Peterborough, Newborough, and Eye, T.W.B.

Limnæa palustris (Müll.).—Newborough, T.W.B.; Little Sea at Far Cotton, seven, W.D.C.

Limnæa truncatula (Müll.).—St. James' End Meadows at Northampton, three, W.D.C.

Ancylus fluviatilis var. **albida** Jeff.—Canal at Blisworth, twelve, W.D.C.

Arion ater (L.).—Weedon, Aug. 16th, 1883, very plentiful there, and widely distributed round Northampton, W.D.C.

Arion hortensis Fèr. var. **fasciata** [=type].—Wood near Northampton, among dead damp leaves, W.D.C.; garden, 7, Alfred Street, Northampton, three, Sep. 1884, small, with yellow foot-sole, W.D.C.

Limax maximus L.—Gardens, Northampton, May, 1883, W.D.C.

Limax maximus v. **subunicolor** Roeb.—One, found in a cellar in the town of Northampton, W.D.C., Sept., 1884. This was an enormous specimen, measuring 185 millimetres or nearly 8 inches long when only crawling leisurely; at full stretch it would no doubt attain over 8 inches; the specimen contracted in spirit is fully 5 inches long, and the largest slug we ever saw.

Limax agrestis L., **typica** Less. & Poll. (*'cinereus immaculatus'*).—Northampton, numerous in gardens, Sept., 1884, W.D.C.

Limax agrestis v. **sylvatica** Drap.—Northampton, one, with the type, Sept., 1884, W.D.C.

Succinea putris (L.).—Peterborough, Newborough, and Eye, T.W.B.; meadows by brook-side, Gipsy Lane, Northampton, three, W.D.C.; St. James' End meadow, ten, W.D.C.; canal side at Blisworth, twelve, W.D.C.

Succinea elegans Risso.—Peterborough, Eye, and Newborough, T.W.B.

Vitrina pellucida Müll.—Milton near Peterborough, T.W.B.; Campions Wood, Kettering Road, Northampton, six, W.D.C.; spinney opposite the Queen's Cross, Northampton, in moss, one, W.D.C.

Zonites cellarius (Müll.).—Castor, Milton, and Eye, near Peterborough, T.W.B.; Irchester, several, H.H.S.; Blisworth stone quarry, under stones, two, W.D.C.; Danes' Camp near Northampton, in moss, three, W.D.C.; garden at 27, Green Street, Northampton, under stones, two, W.D.C.

Zonites cellarius v. **albinos** Moq.—Wood-pit at Stivington near Wansford Station, one, W.D.C.

Zonites alliarius (Miller).—Danes' Camp near Northampton, in moss, one, W.D.C.

Zonites nitidulus (Drap.).—Wood-pit at Stivington, four, W.D.C.; spinney opposite Queen's Cross, Northampton, one, W.D.C.; garden at Green Street, Northampton, one, W.D.C.; Campion's spinney, Kettering Road, Northampton, nine, W.D.C.; Milton and Eye near Peterborough, T.W.B

Zonites purus (Alder).—Spinney opposite Queen's Cross, Northampton, nine of this and its variety, W.D.C.

Zonites purus v. **margaritacea** Jeff.—With the type.

Zonites radiatulus (Alder).—Campion's spinney, two, W.D.C.

Zonites crystallinus (Müll.).—Milton near Peterborough, T.W.B.; Campion's spinney, Northampton, two, W.D.C.; spinney opposite Queen's Cross, seventeen, W.D.C.

Zonites fulvus (Müll.).—Campion's spinney nr. Northampton, two, W.D.C.; wall near Moulton Park, one, W.D.C.; Milton near Peterborough, T.W.B.

Helix aculeata Müll.—Eye near Peterborough, T.W.B.; spinney opposite the Queen's Cross, Northampton, several found, one sent, W.D.C.

Helix aspersa Müll.—Peterborough, Eastfield, Eye, &c., T.W.B.; Northampton town, abundant, W.D.C.; Towcester, Oct., 1876, J. Madison; garden at Green Street, Northampton, five, W.D.C.; Castle Ashby, common, R.R.

Helix nemoralis L.—Towcester, J. Madison; Peterborough, Eye, Newark, Thorpe, Castor, and Ailsworth, T.W.B.

H. nemoralis v. **albolabiata** Von Mart.—Eye, T.W.B.

H. nemoralis v. **hyalozonata** Taylor.—Peterborough and Eye, T.W.B.

H. nemoralis v. **rubella** 12345.—Northampton, one, (bands very pale), W.D.C.; Castle Ashby, three (one with bands very pale brown), R.R.; Northampton, two (ground-colour very pale), W.D.C.

H. nemoralis v. **rubella** 1(23)45.—Castle Ashby, one (with bands pale and blotchy), R.R.

H. nemoralis v. **rubella** 123(45).—Castle Ashby, one (ground-colour very pale, bands very pale brown), R.R.

H. nemoralis v. **rubella** 1(23)(45).—Irchester, one, immature (bands interrupted or blotchy), H.H.S.

H. nemoralis v. **rubella** 02345.—Immediate neighbourhood of Northampton, two (bands pale), W.D.C.

H. nemoralis v. **rubella** 00300.—Northampton, two, W.D.C. Castle Ashby, one, R.R. ; Maidford, two, R.R.

H. nemoralis v. **rubella** 00000.—Castle Ashby, two, R.R. ; Northampton, two, W.D.C. ; Irchester, one (ground colour very bright red), H.H.S.

H. nemoralis v. **libellula** (12345).—Castle Ashby, two, R.R.; Irchester, one, H.H.S.

H. nemoralis v. **libellula** 1(23)(45).—Castle Ashby, one, R.R.

H. nemoralis v. **libellula** (123)45.—Castle Ashby, one, immature, R.R.

H. nemoralis v. **libellula** (12)345.—Castle Ashby, one, R.R.

H. nemoralis v. **libellula** 123(45).—Castle Ashby, one, R.R.

H. nemoralis var. **libellula** 1(23)45.—Maidford, two, R.R.; Castle Ashby, three, R.R.; Irchester, one, immature, H.H.S.

H. nemoralis var. **libellula** 12345.—Castle Ashby, one (bands pale-brown and blotchy), R.R.; Maidford, two, R.R.; Castle Ashby, three, R.R. ; Northampton, four, W.D.C.; Irchester, one, immature, H.H.S.

H. nemoralis var. **libellula** 00300.—Castle Ashby, one, R.R.; Queen's Cross Road, Northampton, two, W.D.C.

H. nemoralis var. **libellula** 00000.—Castle Ashby, three, R.R. ; Northampton, one, W.D.C. ; Irchester, one, H.H.S.

Helix hortensis Müll.—Eye, Peterborough, Thorpe, and Newark, T.W.B.

H. hortensis var. **arenicola** Macgill.—Peterborough and Eye, T.W.B.

H. hortensis var. **roseolabiata** Taylor.—Thorp, Eye, Dogsthorp, and Eastfield, all near Peterborough, T.W.B.

H. hortensis var **incarnata** 00000.—Canal bank near Blisworth, one, W.D.C. ; Duston Road, Northampton, two, W.D.C.

H. hortensis var. **lutea** ooooo.—Canal bank near Blisworth end of tunnel, fourteen, W.D.C.

H. hortensis var. **lutea** 10345.—Canal bank near Blisworth, four, W.D.C.

H. hortensis lutea 10345 **arenicola.**—Canal bank near Blisworth, one (bands tinged with brown at the mouth), W.D.C.

H. hortensis v. **lutea** 12345.—Northampton, four (bands pale in two, somewhat cloudy in one, light brown and blotchy in one), W.D.C.; Canal bank near Blisworth, eleven, W.D.C.; Northampton, three, W.D.C.

H. hortensis v. **lutea** 12345 **roseolabiata.**—Canal bank near Blisworth, three, W.D.C.

H. hortensis v. **lutea** (12)345.—Northampton, one, W.D.C.

H. hortensis v. **lutea** 1(23)45.—Canal bank near Blisworth, one, immature, W.D.C.

H. hortensis v. **lutea** 123(45).—Canal bank near Blisworth, one, immature, W.D.C.

Helix arbustorum L.—Eye, Newark, Peterborough, Thorpe, Milton, and Ailsworth, T.W.B.; Midland railway bank at Cow Meadow, Northampton, one, W.D.C.; Culworth, Aug. 5, 1880, one, R.R.

H. arbustorum var. **marmorata** Taylor.—Ailsworth near Peterborough, T.W.B.

H. arbustorum v. **pallida** Taylor.—Ailsworth near Peterborough, T.W.B.

H. arbustorum v. **flavescens** Moq.—Ailsworth and Eye, T.W.B.

Helix Cantiana Mont.—Castor and Ailsworth near Peterborough, T.W.B.; Midland railway bank near Souldrop (on the Bedfordshire border), six, W.D.C.; canal bank, Blisworth, near the tunnel, eighteen, W.D.C.; Castle Ashby, four, R.R.

H. Cantiana v. **albida** Taylor.—Kingscliffe, four, immature, small and very white, on the bare face of a railway cutting, geological formation Great Oolite, C. T. Musson.

Helix rufescens Penn.—Eye, Thorpe, Castor, Ailsworth, and Peterborough, T.W.B.; Irchester, plentiful, H.H.S.; canal bank, Blisworth, three, W.D.C.; stone quarry at Wotton, eighteen, W.D.C.; garden at Green Street, Northampton, ten, W.D.C.; wood-pit at Stivington near Wansford Station, five, W.D.C.; Castle Ashby, eight, R.R.

H. rufescens var. **minor** Jeff.—Newborough and Eye, T.W.B.

H. rufescens var. **rubens** Moq.—Irchester, one, with type, H.H.S.

H. rufescens var. **alba** Moq.—Ailsworth, T.W.B.

Helix concinna Jeff.—The gardens of Holdenby House, twenty-eight, W.D.C.; brick-pit at Kingsthorpe Hollow, under stones, eleven, W.D.C.

Helix hispida L.—Eye, Thorpe, Milton, Castor, Newborough, all near Peterborough, T.W.B.; Irchester, a few, H.H.S.; wood-pit at Stivington near Wansford Station, eight, W.D.C.

Helix sericea Müll.—Newborough and Eye, both near Peterborough, T.W.B.

Helix virgata Da Costa.—Thorpe, Milton, Ailsworth, Dogthorp, all near Peterborough, T.W.B.; canal bank and stone-quarry at Blisworth, twelve, W.D.C.; canal bank at Banbury Lane near Blisworth, three, W.D.C.; field near Harlestone Firs, Northampton, eight, W.D.C.; 'quarry field' near Milton, four, W.D.C.; Castle Ashby, seven, R.R.

H. virgata var. **alba** Taylor.—Dogthorp near Peterborough, T.W.B.

Helix caperata Mont.—Eye, Castor, both near Peterborough, T.W.B.; stone-quarry at Blisworth, five, W.D.C.; wood-pit at Stivington, nine, W.D.C.; Hop Ground spinney at Castle Ashby, one, R.R.

H. caperata var. **major** Jeff.—Eye near Peterborough, T.W.B.

H. caperata var. **ornata** Pic.—Wood-pit at Stivington, with type, W.D.C.

Helix ericetorum Müll.—Newark, Eye, and Newborough, all near Peterborough, T.W.B.; Wooton stone-quarry, three, W.D.C.; Milton quarry-field, six, W.D.C.; Blisworth stone-quarry, plentiful, W.D.C.; Irchester, one, H.H.S.

H. ericetorum var. **minor** Moq.—Milton quarry-field, with the type, W.D.C.

H. ericetorum var. **alba** Charp.—Green's Norton, H. Nelson; Blisworth stone-quarry, with type, W.D.C.

Helix rotundata Müll.—Eye, near Peterborough, T.W.B.; Irchester, several, H.H.S.; wood-pit at Stivington, seven, W.D.C.; gardens of Holdenby House, eighteen, W.D.C.; brick-pit, Kingsthorpe Hollow, eight, W.D.C.; Campion's Spinney, on the Kettering Road, Northampton, three, W.D.C.; Castle Ashby, two, R.R.

Helix rupestris Drap.—Milton near Peterborough, T.W.B.

Helix pulchella Müll.—Eye and Newborough, T.W.B.; wall near Moulton Park, one, W.D.C.; ant-hills, Blisworth stone-quarry, seventeen, W.D.C.

H. pulchella var. **costata** Müll.—Ant-hills, Blisworth stone quarry, with the type, W.D.C.

Helix lapicida L.—Castle Ashby, lime-tree, December, 1878, one, R.R.

Bulimus obscurus (Müll.).—Wood-pits at Stivington, six, W.D.C.; Shittelwell Pit, Gipsy Lane, Northampton, one, W.D.C.; Castle Ashby, under stones, four, R.R.

Pupa umbilicata Drap.—Eye, T.W.B.; Irchester vicarage-garden, a few, H.H.S.

Pupa marginata Drap.—Eye, T.W.B.; Irchester vicarage-garden, one, H.H.S.; ant-hills at Blisworth stone-quarry, ten, W.D.C.; wood-pit, Stivington, four, W.D.C.; near Moulton Park, a quantity from a moss-covered wall, W.D.C.; Castle Ashby, one, R.R.

Vertigo pygmæa (Drap.).—Castle Ashby, one, R.R.

Vertigo edentula (Drap.).—Campion's Spinney, on the Kettering Road, Northampton, one, W.D.C.; Castle Ashby, two, R.R.

Balea perversa (L.).—On elm-trees in avenue leading to Campion's Spinney, twenty-three, W.D.C.; near Moulton Park, from a moss-covered wall, twenty-five, W.D.C.; Castle Ashby, two, R.R.

Clausilia rugosa (Drap.).—Milton, near Peterborough, T.W.B.; Irchester vicarage-garden, abundant, H.H.S.; Midland railway-bank, opposite Souldrop, Beds., one, W.D.C.; wood-pit, Stivington, forty-six, W.D.C.; Castle Ashby, several, R.R.

Clausilia laminata (Mont.).—Castle Ashby, five, R.R.; near Moulton Park, on wall and on neighbouring elm-trees, twenty-nine, W.D.C.

C. laminata var. **albinos** Moq.—Near Moulton Park, with type, four, W.D.C.

Cochlicopa lubrica (Müll.).—Eye, near Peterborough, T.W.B.; Irchester vicarage-garden, a few, H.H.S.; Campion's Spinney, two, W.D.C.; rejectamenta of River Nene at St. James' End, three, W.D.C.; Spinney opposite Queen's Cross, seven, W.D.C.; Castle Ashby, four, R.R.

C. lubrica var. **lubricoides** Fer.—Eye, near Peterborough, T.W.B.

Carychium minimum Müll.—Eye, near Peterborough, T.W.B.; Spinney opposite Queen's Cross, seven, W.D.C.; Campion's Spinney, thirteen, W.D.C.

[ERRATA.—The locality, St. James' End, given for *Physa fontinalis*, should refer to *Physa hypnorum*, *P. fontinalis* being quite common in the river Nene and water in connection with it. Under *U. tumidus* and *A. anatina*, for Welton read Weeton; and in *P. corneus*, Bramston should be Braunston.]

NOTE ON THE ANATOMY OF *HELIX SERICEA* Müll.

By CHARLES ASHFORD.

The species passing under the above name in this country —usually referred to abroad as *H. granulata* Alder—has organic peculiarities which appear to be imperfectly known. It may be well to point out some of them.

1.—It has no dart-sac and, of course, no dart. In some instances the vagina is slightly dilated, but there is no trace of local protuberance which could be construed as a rudimentary sac even in fully grown examples.

2.—It possesses no mucous glands at any stage of its growth.

3.—The right tentacular tube is *free*, as in a few other Helices, viz., *H. ericetorum*, *H. virgata*, *H. Cartusiana* ... that is to say it does not, as is usually the case, pass between the male and female organs embracing the former in its loop.

4.—The spermatheca is large and subtriangular, supported by a stoutish stem or duct about half the length of the oviduct.

5.—The flagellum is very short, scarcely more than a hooklet. The superior part of the penis-sheath is attenuated, the inferior part much dilated, and the upper end of the swollen portion is for a short distance longitudinally striped with opaque white lines. The retractor muscle is attached a little above this striped portion. The sperm-duct is conspicuously broad, see pl. x., fig. 5.

The absence of dart-sac and mucous glands will serve to distinguish *H. granulata* Ald. from any variety or ally of *H. hispida* to which it may superficially bear a resemblance. And with these marks of distinction to guide the collector it is to be hoped its European distribution will before long be more accurately determined.

This species is not the *H. sericea* Drap. nor the *H. rubiginosa* Zgl., both of which have darts—the former a pair like those of *H. hispida*, and the latter a single dart, said to have four blunt edges.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting

HELD JULY 3RD, 1884.

In the Society's Room, Mechanics' Institute. Mr. J. W. Taylor, Vice-President, occupied the chair. The following

DONATIONS

were announced :—

"Abstract of the Proceedings of the Linnean Society of New South Wales," for March and April, 1884; Specimens of *Valvata piscinalis* var. *subcylindrica*, from Ratham, by Mr. Jeffery.

NEW MEMBER.

Mr. Edward Dillon Bostock, of Stone, Staffordshire, was elected a Member of this Society.

PAPERS READ.

1. "On a New Variety of *Limax flavus*," Wm. Denison Roebuck, F.L.S.

2. "On the occurrence of *Arion ater* var. *bicolor* in West Gloucestershire," Wm. Denison Roebuck, F.L.S.

SPECIMENS EXHIBITED.

The chairman exhibited an extensive series of shells illustrating the variations of *Helix nemoralis* and *H. hortensis*, sent by Mr. Hugh Richardson; also a specimen of *Arion ater* var. *pallescens* from Bitterne, near Southampton, sent by Mr. H. P. Fitzgerald, which was full grown, of a yellowish white or deep cream colour with brilliant orange foot-fringe.

Mr. W. D. Roebuck, F.L.S., showed numerous slugs, including *Limax arborum*, *L. flavus*, and *L. maximus*, from Mr. Wm. Jeffery, collected at or near Ratham; *L. maximus* type, a fine example from Headingley, Leeds, sent by Mr. W. E. Clarke, F.L.S.; and *Arion ater* var. *rufa* from Bristol.

Mr. Jeffery also sent specimens of *Limnæa stagnalis* var. *labiata* from Ratham, and *Valvata piscinalis* from Arundel; and Mr. T. W. Bell showed examples of *Helix rufescens* and vars. *albida* and *rubens*, *H. nemoralis* and *H. aspersa* from Driffield.

Meeting

HELD AUGUST 7TH, 1884.

Mr. J. W. Taylor, Vice-President, presided. It was unanimously agreed that the president, Mr. Geo. H. Parke, F.L.S., F.G.S., should represent this society at the forthcoming meeting of the British Association at Montreal.

SPECIMENS EXHIBITED.

A very peculiar example of *Limax maximus* from Airy Holme Wood, NE. Yorkshire, was sent by Mr. Baker Hudson for exhibition. The animal had two dark bands enclosing a light dorsal area, and will be described on a future occasion by Mr. W. D. Roebuck, F.L.S.

The chairman showed on behalf of Miss Ffoulkes Taylor, of Kenilworth, specimens of *Bulimus tridens* from Fiesole, Italy, *Helix vermiculata* from Firenze, Italy, *Pupa frumentum* and *P. cinerea* from Berchtesgaden in Bavaria, and *Testacella Maugeii* from Axbridge, N. Somerset; on behalf of Miss Fairbrass *Testacella haliotidea* var. *scutulum* from Folkestone was shown; also mounted dissections of *Succinea putris* and *S. elegans* prepared by Mr. C. Ashford; and a large number of shells from Ringwood, South Hants.

Mr. W. D. Roebuck exhibited a living specimen of *Helix lactea* taken by the railway side at Pateley Bridge; also numerous examples of *Helix nemoralis*, *H. hortensis*, and *H. arbustorum* collected at Gunnerside in Upper Swaledale, together with *Zonites cellarius*, *Z. nitidulus*, *Helix concinna*, &c. Most of the *H. arbustorum* were of the *alpestris* form, and there were some good examples of the var. *minor* of *H. hortensis*.

Meeting

HELD AUGUST 28TH, 1884.

Mr. J. W. Taylor, Vice-President, in the chair. The following DONATION was announced :—

"Proceedings of the Linnean Society, New South Wales," vol. ix. part 1.

SPECIMENS EXHIBITED.

Mr. S. C. Cockerell sent for exhibition a variety of shells, amongst which were examples of *Planorbis corneus* from New Cross, Kent; *Limnæa truncatula* from Bromley, Kent; *Helix hortensis* from Weymouth, and also from Lulworth, Dorset; *H. nemoralis* from Sidmouth, Devon; *H. hortensis* and varieties and *H. aspersa* var. *grisea* from Torquay; *Paludina vivipara* from the Thames at Chiswick; and *H. aspersa* and *H. hortensis* var. *arenicola* from Warlingham, Surrey. Specimens of *Anodonta cygnea*, *Planorbis corneus*, *P. carinatus*, *Limnæa stagnalis*, *L. palustris*, and *Succinea elegans* collected at Hoddesden by Mr. Callaway were also shewn. Specimens of *Succinea putris* from Ratham and Arundel were exhibited from Mr. W. Jeffery; and Mr. T. W. Bell showed *Paludina contecta*, *Neritina fluviatilis*, and *Dreissena polymorpha* from the Wash at Thorney in Cambridgeshire.

Meeting

HELD OCTOBER 16TH, 1884.

Mr. J. W. Taylor, Vice-President, in the chair.

DONATIONS.

The following donations were announced:—

"An address," delivered before the British Association at Montreal, 1884, by Lord Rayleigh; "Second List of Members and Associates at the British Association Meeting, 1884"; "Programme of Business of the American Association for the Advancement of Science," by G. H. Parke, F.L.S., President of the Conchological Society; "Proceedings of the Royal Society of Queensland," part 1, vol. i.; "Abstract of the Proceedings of the Linnean Society of New South Wales," for June, July, and August, 1884; "Annual Report of the Smithsonian Institute," for 1881 and 1882; Specimens of *Limnæa stagnalis* var. *labiata* from Ratham, by Wm. Jeffery.

NEW MEMBERS.

Mr. H. P. Fitzgerald, of Basingstoke, and Mr. G. C. Howell, of Plumstead, were nominated for membership.

It was resolved to enter into an Exchange of Proceedings with the Royal Society of Queensland from this date.

PAPERS READ.

1. "A List of the Mollusca of Northamptonshire, authenticated by the Society's Referees."

2. "Variation in *Limax maximus*, L.," by Wm. Denison Roebuck, F.L.S.

SPECIMENS EXHIBITED.

Mr. W. Jeffery sent for exhibition specimens of *Limnæa stagnalis* var. *labiata* and *L. peregra* var. *acuminata* from Ratham.

In an accompanying note on the *L. stagnalis*, Mr. Jeffery observes :—"This variety appears to be generally the last stage of growth in these ponds. After the season of reproduction appeared to be over, all, or nearly all, the full grown specimens commenced cleaning the confervoid growth from the edge of the shell. I have seen them contorting their bodies to perform this for themselves, and also doing it for each other, preparatory to the new formation."

Mr. Baker Hudson sent several specimens of *Vertigo pygmæa* var. *quadridentata* for exhibition.

Examples of *Limnæa peregra* from Valnes, *Vitrina pellucida*, *Helix arbustorum* and var. *fusca* from Seydisfyorde, Iceland, recently collected by Mr. W. E. Clarke, F.L.S., were also shown.

The chairman exhibited a series of shells collected by Mr. W. Whitwell, at Oxford, which included *Planorbis albus* var. *Draparnaldi*, *P. carinatus* var. *disciformis*, *Limnæa stagnalis* var. *fragilis*, *Physa fontinalis*, and *Bythinia Leachii*.

Meeting

HELD NOVEMBER 6TH, 1884.

Mr. W. D. Roebuck, F.L.S., presided. The following

DONATIONS

were announced :—

"Proceedings of the Linnean Society, New South Wales," vol. ix. part 2 ; "Monograph of the Land Shells of Tasmania," Mr. R. D. Darbishire.

NEW MEMBERS.

Mr. George Owen Howell, Ripon Villas, Plumstead, and Mr. H. Purefoy Fitzgerald, North Hall, Preston Candover, near Basingstoke, were elected members of the society.

PAPERS READ.

"Notes on some species of the Molluscan Fauna of County Durham," Mr. Baker Hudson.

SPECIMENS EXHIBITED.

Mr. B. Hudson sent a large series of shells collected by himself in various localities in Co. Durham, for authentication and exhibition; particulars are entered in the record books of the society.

Mr. R. D. Darbishire sent for exhibition a collection of shells taken by himself at Gibraltar and in the vicinity. The following is a list:—From Gibraltar: *Helix lactea* and vars. *albina* and *alybensis*, *H. coquandi*, *H. marmorata* and var. *Balearica*, *H. pisana*, *H. aspersa*, *H. variabilis*, *H. conspurcata*, *H. lens*, *Parmacella Deshayesii*, *Zonites cellarius*, *Bulimus decollatus*, *B. acutus*, *B. folliculus*, *B. ventricosus*, *Achatina acicula*, and *Limax flavus*. From San Roque near Gibraltar: *Helix lactea*, *H. apicina*, *Physa acuta*, *Melanopsis Dufouri*, *Pisidium fontinale*, *Succinea elegans*, and *Limnæa peregra*. From Tangiers: *Helix lactea*, *H. coquandi*, *H. aspersa* var. *unicolor*, and *Ancylus fluviatilis*.

Meeting

HELD DECEMBER 4TH, 1884.

Mr. J. W. Taylor, Vice-President in the chair

PAPER READ.

"Variation of *Limax arborum*," by W. D. Roebuck, F.L.S. This was a description of several well defined varieties of this species.

SPECIMENS EXHIBITED.

The number of specimens shown at this meeting was very large and varied. It included the following:—varieties of *Helix nemoralis* from Malahide, sent by Mr. J. Palmer; a series

of land and freshwater shells collected at or near Ramsgate, from Rev. H. H. Slater, M.A., amongst which were examples of *Hydrobia ventrosa*, *Bythinia Leachii*, *Cochlicopa lubrica*, *Clausilia rugosa* var. *gracilior*, *Pupa umbilicata*, *Helix concinna*, and others. Also specimens from Mr. T. D. A. Cockerell; from Messrs. A. Coward and C. Oldham from Baguley; and Mr. W. D. Roebuck showed numerous shells from Yorkshire localities and from Witherslack in Westmoreland.

On behalf of Capt. Becher, R.A., the chairman showed examples of *Helix Spratti*, *H. melitensis*, *Clausilia osculans*, *Cl. mamotica*, and *Physa melitensis*, all from Malta; also *Pisidium fontinale* and *Limnæa peregra* from Mr. Duncan, of Montrose; *Sphærium lacustre* from Mr. H. P. Fitzgerald, Preston Candover; a specimen of *Amphipeplea Petterdi* from New Guinea; and a collection from Mr. John Hopkinson, F.L.S., which included *Zonites fulvus*, *Z. excavatus*, *Helix aculeata*, *H. caperata*, *Clausilia rugosa*, and others, all from Barmouth.

Mr. W. Nelson showed examples of *Limnæa acuminata* from Carlisle, and *Limnæa glabra* from Corby, Cumberland.

The Collections of European Mollusca of Dr. Tiberi.—The European collection of mollusca of Dr. Tiberi, of Naples, which is one of the most extensive of southern Europe, has been sold. The marine portion has been bought by the Marchese di Monterosato, of Palermo, and the land and freshwater portion comes to this country, having been purchased by the Rev. A. M. Norman, D.C.L. It contains 2531 lots, being especially rich in the species and varieties of southern and eastern Europe.

Clausilia rugosa monst. **dextrorsum in Stirlingshire.**—Mrs. Skilton of Brentford, Middlesex, informs me that a specimen of this form has been found at Slamannan in Stirlingshire, which is now in her collection.—J. W. TAYLOR, Dec. 23rd, 1884.

ADDITIONS TO THE LAND SHELLS OF GIBRALTAR,

By J. PONSONBY.

Dr. Kobelt published in the Nachrichtsblatt of the German Malacozoological Society a list of the Land Shells found by him on the rock of Gibraltar, observing at the same time that further research would doubtless result in the discovery of additional species there. This prediction has been verified, and we are now enabled to add the following to the original list of twenty species:

21. **Helix apicina** Lam.—Plentiful on the grass outside the Landport gate.
22. **Hyalina Botterii** (Parr.) Pfr.
23. **Hyalina hydatina** Rsm.—These two small species are found under stones amongst damp herbage. They are rare.
24. **Pupa granum** Drap.—Not uncommon under stones in dry exposed places.
25. **Pupa minutissima** Hartm.—Common amongst detritus at the foot of the cliffs. It has not yet been observed in a living state.
26. **Cæcilianella Petitiana** Ben.—Dead specimens with the foregoing. More rarely living under stones rather deep in the ground, in damp places where there is grass, or shade from trees.
27. **Acme** —— ? n. sp.—A single dead specimen with *Pupa minutissima.*

Dr. Boettger, the well-known Conchologist of Frankfort, has been good enough to identify all the foregoing. With reference to the Acme, he has supplied a diagnosis written with his accustomed care and skill. He speaks of the shell as "*peraffinis H. sublineatæ Andr.*" The publication of this description is however withheld for the present, in the hope that further specimens of this minute species (alt. 3 mill., diam. ⅞ mill.) may be discovered later on.

Amongst the shells enumerated by Dr. Kobelt is "No. 14, *Helix (Xerophila)* —— ?" Dr. Boettger now pronounces these shells to be undistinguishable from our British *Helix virgata.*

THE DARTS OF BRITISH HELICIDÆ.

By CHARLES ASHFORD.

PART VII. (CONCLUDING).

The seventeen species which have now been described comprise all the British dart-bearers at present known. Of the remaining species of both genera—Zonites and Helix—all have received a certain amount of examination from various malacologists, and the organisation of a large majority has been thoroughly ascertained. Nevertheless, it would be satisfactory if some of the minuter kinds underwent, at the hands of a skilful manipulator, a more rigorous and a final scrutiny. A few examples of *Helix lamellata* and *H. aculeata*, obligingly sent me from the North of Scotland, by Mr. W. Baillie, of Brora, yielded no positive evidence, but in these cases the entire bodies were dissolved without previous dissection.

To sum up, we have in the British Isles—with two darts—*H. ericetorum*, *H. rufescens*, *H. concinna*, and *H. hispida*; with one dart, *Zonites nitidus*, *Z. excavatus*, *Helix pomatia*, *H. aspersa*, *H. nemoralis*, *H. hortensis*, *H. arbustorum*, *H. fusca*, *H. Pisana*, *H. virgata*, *H. caperata*, *H. pulchella*, and *H. lapicida*; or, arranging in accordance with the form of dart-sac, we have—with two bilobed sacs, *H. rufescens*, *H. concinna*, *H. hispida*; with two simple sacs, *H. ericetorum*; with one bilobed sac, *Z. excavatus*, *H. fusca*; with one simple sac, *Z. nitidus*, *H. pomatia*, *H. aspersa*, *H. nemoralis*, *H. hortensis*, *H. arbustorum*, *H. Pisana*, *H. virgata*, *H. caperata*, *H. pulchella*, *H. lapicida*.

We find then that, omitting the two Zonites, the ratio of dart-bearing Helices to all the species of that genus in this country is 15 to 25, or 60 per cent. In 1853, Adolf Schmidt reported that he had examined up to that date 77 species of Helix, chiefly European, with a few from N. Africa and Syria, and had found 51 furnished with darts. This is about 66 per cent. The per-centage for France alone, as nearly as can be

estimated from Moquin-Tandon's anatomical details (not always fully given) lies between 60 and 66. According to Dr. Leidy, the United States are remarkably deficient in indigenous dart-bearing species. Only four such were known when A. Binney's work appeared in 1851, and these four are now considered referable to Zonites rather than Helix. Since that date, anatomical investigation has been greatly extended, and the number just quoted has certainly been increased, (cf. 'Notes' by W. G. Binney, 1856—1875...) but I have no summary at hand from which to estimate a per-centage. Of the structure of tropical Helices, but little is known beyond the shell.

Here these notes might with propriety close. But it is thought the subject will be rendered more complete if brief reference be made to a few other British species which, though not furnished with darts, are more or less allied in structure to those possessing them. They are as follows:—

Helix revelata Mich., pl. x., fig. 1. This has a rudimentary,* naturally empty, sac on each side of the broadly dilated vagina, obscurely bilobed in adults and surmounted by four short but perfectly characteristic, opaque, whitish or yellowish mucous glands, two on each side. In immature examples the sacs are scarcely perceptible and the mucous glands shorter. The figure is drawn from one of a parcel kindly sent me by Mr. B. Tomlin, of Pembroke College, Cambridge, and collected by him in Guernsey in the month of July.

Helix obvoluta Müll., pl. x., fig. 2. Has a long cœcum attached to the vagina close below its junction with the spermatheca-duct, and having at its inferior extremity another but much shorter cœcum. Moquin-Tandon considers these to constitute a mucous gland with a branch. Schmidt, on the contrary, thinks the longer tube may be

* I may be technically wrong in calling these sacs rudimentary; perhaps the are nascent.

taken as a mucous gland and the shorter one as a representative of the dart-sac. This is the only species here described which I have been unable to examine, and Schmidt's figure has been reproduced in an adapted form.

Helix Cartusiana Müll., pl. x., fig. 3. This has a well-developed double group of simple, bifid or trifid mucous glands from 3 to 5 mm. long. Below these and in the place where a dart-sac might be expected is an appendage of very peculiar form, better understood from the figure than by description. Is this organ to be considered a modified dart-sac? Moquin-Tandon thinks it is, but Schmidt gives reasons for an opposite opinion. The figure is from one of two or three dozen examples favoured by Mr. J. H. A. Jenner, of Lewes, and collected by him in that locality. I found the organ in question very constant in shape, and varying but little in size.

Helix Cantiana Mont., pl. x., fig. 4. Here we find a new departure. This species has, like the last, two characteristic bundles of mucous glands about 5 mm. long, dividing into 3 to 5 blue-white semi-transparent branches. But there is no organ in the usual position of the dart-sac. Lower down we find a long, (10 to 15 mm.) tapering, blue-white appendage joining the common vestibule opposite to, or a trifle lower than, the base of the penis-sheath. Moquin Tandon does not even mention this most conspicuous organ. Schmidt thinks it cannot be taken as a substitute for a dart-sac on account of its position. He is probably right, for *H. pyramidata* and *H. elegans* appear to have mucous glands and dart-sacs in the usual position, and, *in addition*, lower down, an appendage somewhat similar in character to that in *H. Cantiana*. An apparently analogous organ in an American species is called by W. G. Binney a 'vaginal prostate.' The figure is from a Christchurch example.

Bulimus acutus Müll. This species has no mucous glands and no dart-sac. But it possesses a single, attenuated, accessory organ similar and somewhat similarly situated to that in *H. Cantiana*. Moquin-Tandon calls this a simple mucous gland, an interpretation which can scarcely be correct.

Helix sericea Müll. (not Drap.)=*H. granulata* Alder, pl. x., fig. 5 has no immediate connection with the dart-bearers and only finds mention here because it is still often supposed by continental conchologists to have a dart. Figure 5 from a Christchurch specimen is given to show the simplicity of its organisation in the absence of accessory organs.

To numerous correspondents who have afforded most valuable aid by forwarding examples for the purposes of these papers, I must return sincere thanks. Especially am I under obligation to Mr. J. W. Taylor, of Leeds, and Mr. J. H. Ponsonby, of London, both of whom have been indefatigable in procuring living specimens from various parts of the country.

The following errors should be corrected :—

Introductory Section.—For 'Gener. des Gaster,' read 'Génér. des Gastér.'

Under *H. Pisana*.—For 'wormförmig,' read 'wurmförmig.'

The figure of dart of *H. nemoralis*, pl. vii., fig. 4, should be quite straight.

Christchurch, December, 1884.

Astarte borealis.—I have received amongst other shore shells from the beach at Warkworth, Northumberland, a valve of this shell with a very fresh epidermis. Its condition resembles that of specimens taken from a fish's stomach.—R. D. DARBISHIRE.

NOTES ON A COLLECTION OF GUERNSEY AND SARK MOLLUSCA MADE BY J. R. BROCKTON TOMLIN, IN AUGUST, 1884.

By J. W. TAYLOR.

Through the kindness of Mr. Tomlin, of Pembroke College, Cambridge, I have received a small collection of the Land and Freshwater Shells collected by himself at the islands of Guernsey and Sark.

Mr. Tomlin, in his letter accompanying the specimens, says: "seeing the dearth of records for these islands, I thought it might be of use to send you some specimens while I am on the spot. The Freshwater species are a fairly complete set with the exception of *Limnæa glabra*, *L. truncatula*, *Pisidium nitidum*, and the two species of *Ancylus*."

Mr. Tomlin mentions in his communication the occurrence of *Arion ater*, *Limax agrestis*, *L. maximus*, and *Amalia gagates*, but was unfortunately prevented from sending specimens. The total number of species in the collection is nineteen, of which six only are freshwater.

As inhabitants of the Channel Islands, Dr. Jeffreys' British Conchology gives (either inferentially or directly) the following additional 31 species, of which I have not yet seen specimens. *Sphærium corneum*, *S. lacustre*, *Pisidium nitidum*, *P. roseum*, *Planorbis lineatus*, *P. nautileus*, *P. spirorbis*, *L. truncatula*, *L. glabra*, *Ancylus fluviatilis*, *Limax gagates*, *L. arborum*, *Testacella haliotidea* v. *scutulum*, *Succinea elegans*, *Zonites nitidus*, *Z. crystallinus*, *Helix aculeata*, *H. virgata*, *H. caperata*, *H. rotundata*, *H. pygmea*, *H. pulchella*, *Pupa ringens*, *P. marginata*, *Vertigo antivertigo*, *V. pygmea*, *V. edentula*, *Balea perversa*, *Achatina acicula*, *Carychium minimum*, and *Cyclostoma elegans*.

Pisidium pusillum Gmel.—Four specimens of this species, collected at Sark, were sent, all moderately uniform in size and appearance and encrusted with an apparently ferruginous deposit. The average dimensions are 2¾ mill. from beaks to front margin, and 3 mill. wide.

Planorbis spirorbis v. **ecarinata** Jeff.—These specimens are very interesting. They are the *P. spirorbis* of Continental authors, differing from the typical *P. spirorbis* of British authors (which is considered by foreign conchologists a distinct species under Poiret's name of *P. rotundatus*) in the absence of carination and a lesser number of whorls. Dr. Jeffreys in his valuable work does not allow this form specific rank, but describes it as var. *ecarinata*, adding a subsidiary colour character to the description, presumably to more accurately describe the British specimens. The Guernsey specimens are of a brownish horn colour, have from 4½ to 5 whorls, and are 4½ mill. in diam., and 1 mill. in height or thickness.

Planorbis vortex (L.).—There are two specimens of this; one not quite mature, the other larger than average specimens, but flatter than usual. Dr. Jeffreys gives the average dimensions as 5½ mill. by 1¼. The Guernsey shell is 9 mill. broad, and with an altitude of only 1 mill.

Physa hypnorum (L.).—Mr. Tomlin sent two of this species. They were of ordinary size and aspect, but were accidentally crushed before I had taken note of their peculiarities.

Limnæa peregra v. **ovata** Drap.—The specimens are a small form of v. *ovata*, but have a shorter spire than the fully characteristic form of that variety. The dimensions are total length 11 mill., width 10 mill. The measurement of the aperture is 8½ × 5 mill.

Limnæa palustris (Müll.).—Are proportionately stouter than typical specimens. Dr. Jeffreys gives the average dimensions of this species as length 25 mill., diam. 10 mill. The Guernsey specimens are only 16 mill. in length, while their diameter is 11 mill. The aperture is 8 × 3½ mill. The shells are faintly spirally ridged, and have the purplish mouth of v. *tincta*, to which variety these specimens may be referred, though hardly having all necessary peculiarities.

Succinea putris v. **Ferussina** Moq-Tand.—The two specimens of *S. putris* seem referable to this variety. They agree exactly with the figures given by Dr. Baudon in his Monograph of Succinea, and accord well with the description. The dimensions are 11½ mill. × 4½ mill.; aperture 6½ mill. × 3½ mill.

Zonites cellarius Müll.—Two examples of this species were sent. One was an extra large specimen, rather more elevated than usual, and without trace of the usual whitish opacity around the umbilicus. The size is 13½ mill. in diam. with an alt. of 6¾ mill. Dr. Jeffreys gives the average dimensions as 5 mill. high and 12½ mill. broad.

Zonites alliarius (Miller). — The two specimens of this species are of ordinary appearance, but with the spire more elevated than given by Dr. Jeffreys. The dimensions are: alt. 3¾ mill., diam. 6½ mill. Dr. Jeffreys gives the diam. as 6⅞ mill. and alt. 2½ mill.

Zonites nitidulus (Drap.).—Only one specimen of this species was enclosed in the parcel. It is a trifle more depressed than usual, having an alt. of 3⅛ mill. and a breadth of 8¼ mill. The dimensions as given by Dr. Jeffreys are: alt. 3¾ mill., diameter a trifle over 8 mill.

H. aspersa var. **tenuior** Shuttl.—A very interesting specimen of this variety was sent by Mr. Tomlin. It is very thin and translucent and faintly banded with five transparent bands, and is 21 mill. in diam., with an alt. of 18½ mill.

Helix nemoralis L.—The six specimens of this species were from Sark: half of them were of a somewhat depressed form, and one more conical than the others. I give full particulars as follows:—

1. Var. *libellula* (00300) diam. 20 mill., alt. 15 mill., a slight trace of No. 5.

2. Var. *libellula* (00305) diam. 18½ mill., alt. 13½ mill. The third band in this specimen is unusually broad, the fifth is very finely linear. The outer lip is distinctly bimarginate.
3. Var. *libellula* (12345). The bands, though entirely coalesced near the aperture, are to some extent separate on the earlier whorls, the lip is not completed, but seems to indicate that it will partake of the character of var. *bimarginata* Picard. This specimen is the most conoid, diam. 18 mill., alt. 15½ mill.
4. Var. *rubella* 00(34)0. Alt. 16 mill, breadth 18½ mill. Lip bimarginate.
5. Var. *rubella* 00300. The dark band enclosed within pale zone; aperture bimarginate. Breadth 18½ mill., alt. 14½ mill.
6. Var. *rubella* 00300. Diam 21 mill. alt. 16 mill.

Helix concinna Jeff.—These specimens are possibly not perfectly mature, the rib at the aperture being only slightly shown. They are 8 mill. in diam. by 4½ in alt., and of a horn colour.

Helix hispida L.—These specimens are smaller than usual, having a diam. of 6½ mill. and an alt. of 4 mill. The average size the species attains is 7½ mill. × 4¾ mill. The Guernsey specimens are comparatively sparingly hirsute and faintly lineate at the periphery.

H. hispida var. **conica** Jeff.—This specimen is of about the usual consistency of a reddish horn colour, and I think its produced spire makes it properly referable to this variety. The dimensions are: diam. 7 mill., alt. 5⅛ mill.; aperture alt. 3½ mill., diam. 3 mill.

Helix revelata Mich.—This species varied but little in size; in the specimens sent the largest was 6½ mill. broad by 3½ mill. high, the smallest was 5½ mill. × 3 mill., none reaching the normal size—7 mill. × 4½ mill.

Helix Pisana Müll.—The apparent dwarfing of Guernsey shells is again shewn in this species, the two specimens from Vazon Bay sent by Mr. Tomlin are only 10 mill. high and 15 mill broad, the typical dimensions being 12½ mill. × 17½ mill. The ground colour is buff, darker beneath, with numerous fine but irregularly broken spiral lines, embryonal whorls are purplish black. There is scarcely a trace of pink at the aperture.

Helix rupestris Drap.—A single specimen of this species was sent, rather under the normal size; its dimensions were: diam. 2¾ mill., alt. 1¼ mill.

Bulimus acutus (Müll.).—The single specimen sent is 4¾ mill. in diam., and 11½ mill. in length, has 8½ whorls, is of a dull buff or ochreous ground colour, with a few transverse dark-brown streaks which appear by transmitted light transparent and colourless. The embryonal whorls are simply horny, with markings.

Pupa umbilicata Drap.—The two specimens are of normal size as given by Dr. Jeffreys; the reflected lip is flesh-coloured.

Clausilia rugosa (Drap.).—These specimens vary a little in size and ventricosity, and have twelve whorls, the average size being 12 mill. by 3 mill. in diameter. Jeffreys gives the dimensions as 12½ mill. × 3½ mill.

C. rugosa var. **gracilior** Jeff.—One specimen may be referred to this variety; it has the whorl more than usual and is 13¼ mill. long by 2½ mill. in diameter. To be strictly characteristic the dimensions should be about 14 mill. × 2¼ mill.

Cochlicopa lubrica (Müll.).—The two examples of this species are again smaller than usual, the outer lip is of a pale colour, and the size is 2 mill. × 5¼ mill.

VARIATION IN *LEHMANNIA ARBORUM*, THE TREE-SLUG.

By WM. DENISON ROEBUCK, F.L.S.

[Read before the Conchological Society, December 4th, 1884.]

In continuation of my intention of bringing together for the use of English collectors the various descriptions of the varieties of slugs which have been characterized by authors, I now lay before you those of the tree-slug.

For most of the varieties it will be seen that we are indebted to the Italian malacologists, and particularly to Lessona and Pollonera, as given in their magnificent 'Monografia dei Limacidi Italiani.'

In that work they offer some remarks bearing on the influence of climate upon variation which it will be of interest to reproduce. They state that the length of the keel is very variable, and that it is generally short in the individuals which inhabit the lower regions, but longer in those of the elevated regions, and sometimes so much as to reach to almost four-fifths of the length of the back. Generally this lengthening of the keel is accompanied by obscuration of the colouring, so that the individuals found in the most elevated regions of the Alps of Piedmont seem practically black [var. *rupicola*], the usual light length-bands being invaded by a blackish tint to so great an extent as to render them practically obsolete.

My own experience of the present species tends to bear out these views. It appears to be in Britain a decidedly northern species, for although it occurs in every part of the British Islands, it is to be regarded as being more a sporadic and woodland species in the south, while in the north of England it becomes of wider range, and in the north of Scotland it is one of the commonest forms of slugs, surpassing *L. agrestis* (which is more addicted to cultivated land) and almost rivalling *Arion ater* in abundance. I have also noticed that the Scottish specimens are much darker and not so translucent as the southern English.

These observations, combined with those of many English naturalists in respect of the darkness of the individuals of *Limax agrestis* found in winter, tend to show that it is either lowness of temperature or deficiency of light that brings about deepening of colour. Additional observations bearing on these points would be of value.

SYNOPSIS OF VARIETIES.

a. Var. **typus** Less. & Poll.

Cinereo-violacens, cinereo-cyanescens vel brunneus, subunicolor, dorso zonula pallida mediana ; clypeo zonis nigrescentibus duabus. Carina brevis. (Less. & Poll., 1882).

LOCALITIES.—Piedmont and Lombardy (Less. & Poll.).

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b. Var. **nemorosa** Baudon.

Baudon, who originally described this variety, characterized it thus :—

'*Griseo rufa, perfasciata in clypeo et in utroque latere carinæ.*'

He further described it as a form nearly resembling the type, though less slender; reddish grey mixed with brown, wlth a scarcely indicated general bluish tint; bands well marked laterally on the shield, and two on each side of the back; that which follows the keel being of ā deeper brown; the cariniform band the colour of 'café-au-lait' as far as the caudal extremity; whitiṣh marks present, especially at the belly; the pulmonary orifice surrounded by a pale red circle; the jaw soft, larger than in the type of the species.

Lessona & Pollonera in 1882 describe the form thus:—

'*Præcedenti* [*i.e. formâ typicâ*] *similis, dorso zonis nigrescentibus longitudinalibus duabus, lateribus sæpe maculatus. Carina brevis.*'

LOCALITIES.—Forest of Hez, dep. de l'Oise (Baudon); Bramepan, dep. des Basses-Pyrénées (De Folin et Bérillon); Piedmont and Lombardy (Less. & Poll.). Not yet recorded for Britain.

c. Var. **Bettonii** Sordelli.

'*Animal ornatissimus, dorso albo fuscoque maculato, zonula albida mediana zonis duabus fuscis concomitantibus; clypeo zona fusca mediana, zonis lateralibus albidis et fuscis alternantibus. Carina brevis.*' (Less. & Poll., 1882).

Pini (Moll. d'Esino, 1876) remarks that this mutation of *L. arborum* is one with the coloration clearer, and in which the lateral bands of the body are more widened, pale, and interrupted with yellowish-white granulations which produce a similarity to the markings of *Limax flavus*. In Lombardy this variety abounds near Monza and Milan (Pini, 1876).

I have now the opportunity of adding this beautiful form to the British list, on the strength of specimens obligingly sent me in the middle of October by Miss Hockin, of Phillack, near Hayle, West Cornwall. There were numerous specimens of *L. arborum*, two of which agreed exactly with the description of Lessona & Pollonera, while some of the others approached it less distinctly. Of the two which I refer to the variety, one, which is lighter-coloured than the other, showed very distinctly the bordering of the two dark bands on the shield by distinct whitish lines. The specimen has preserved this character as a spirit-preparation. The other specimen is more obscure, and reminds one at first glance of the general appearance of *L. agrestis*. It can therefore be more readily understood how Sordelli, in originally describing this variety as a distinct species, erroneously assigned it to a position near to *L. agrestis*. This error he speedily rectified, and he saw that his new species was in reality only a form of *L. arborum*.

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d. Var. **alpestris** Less. & Poll.

'*Animal aliquantulum minor, carina validiore usque ad ½ dorsi; clypeo sæpe zonis obscuris confusis nigricante, dorso unicolore zonula pallida mediana*' (Less. & Poll., 1882).

Found in the Piedmontese Alps. (Less. & Poll., 1882).

e. Var. **pallens** Less. & Poll.

'*Animal pallescens, dorso zonula pallida, et usque ad ⅔ longitudinis carinato; clypeo pallido zonis obscuris subobsoletis.*' (Less. & Poll., 1882).

Found at an elevation of 1653 métres [=5423 feet] on the Alpe di Devero, valle d'Antigorio, Piedmont. (Less. & Poll., 1882).

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f. Var. **rupicola** Less. & Poll.

'*Animal minor, nigricans; zonula pallida dorsali obsoleta vel nulla, carina subtilissima ad ⅔ dorsi producta, clypeo subunicolore vel omnino nigro.*' (Less. & Poll., 1882).

Found in the Piedmontese Alps, especially in the elevated regions. This variety ascends to nearly 2500 metres [=8200 feet] at the Col d'Ollen, Gressoney slope, and of all the Italian slugs is the one that reaches the greatest elevations. (Less. & Poll., 1882).

The Rev. H. W. Lett sent me in the middle of October, 1884, some slugs which he had taken at Newcastle, county Down, Ireland. Among them was an individual of *Limax arborum*, which was black-brown in colour, with the shield nearly unicolorous and with the pale dorsal line practically obsolete, and which agreed with Lessona & Pollonera's description of var. *rupicola* in every character but that of the keel, which was of the normal length or equal to about one-third the length of the back.

It may be as well to mention here that the counties from which I have had the opportunity of seeing specimens of *Lehmannia arborum* are as follows:—

1, Cornwall West; 11, Hants South; 12, Hants North; 13, Sussex West; 18, Essex South; 20, Hertford; 23, Oxford; 27, Norfolk East (shell only); 33, Gloucester East; 34, Gloucester West; 37, Worcester; 38, Warwick; 48, Merioneth; 49, Carnarvon; 50, Denbigh; 56, Notts; 57, Derby; 62, York

North-East; 63, York South-West; 64, York Mid-West; 65, York North-West; 66, Durham; 81, Berwick; 107, Sutherland East; 109, Caithness; 115, co. Down; and 145, co. Waterford. I shall be glad to have specimens from any other country.

REMARKS ON THE LAND AND FRESHWATER MOLLUSCA OF THE MALTESE ISLANDS.

By J. PONSONBY.

In last October's number of this journal, page 229, appeared an article by Capt. Becher, on the Maltese mollusca. The following remarks are made with a view to elicit further information on the subject, and may perhaps lead to the elucidation of some doubtful points.

Capt. Becher mentions several species which he has *not* found. Of these

Helix turrita Phil. is generally supposed to be *H. Caroni* Dsh., a Sicilian shell—see Kobelt's 'Icon.,' vol. v., p. 113, under head *H. Seguentiana.*

H. neritoides Gualt.=*H. aperta* Born ('Pfr. Mn. Hel.' vol. v. p. 465).

Turbo conoidea Broc. is an Odostomia.

Cyclostoma pygmæa Mich. is stated in 'Pfr. Mn. Pneum.' p. 318, to be an Hydrobia, but the author does not say to what species it belongs, and Michaud's specific name does not appear to have been adopted in the latter genus. Might it perhaps be the shell named *Paludina melitensis* by Benoit?

Physa melitensis. Dr. Gulia has described a Physa from Malta under the name of *Physa Mamoi* Gulia. Probably this however may be another synonym of *P. acuta.*

Helix Schembrii Scacchi. In Dr. Kobelt's last edition of his Catalogue of European Land Shells two other species of this group (Turricula) are given with the habitat Malta,

viz., *H. calcarata* Benoit and *H. cucullus* Mart. Thanks to the great kindness of Madame Paulucci, the distinguished Italian conchologist, the present writer has had the opportunity of seeing the two last named shells. It appears that the three run so closely into one another as to be almost inseparable; in fact it is a question whether they may not all prove to be varietal forms of *H. Spratti.* It is hoped that some conchologist, possessed of a large series of Maltese specimens, or who may visit the island, may be able to determine satisfactorily the specific value of these four Helices.

H. meda Porro. It may be worth mentioning that this species was found by the writer, some years ago, among plants on the roof of Morel's Hotel at Valletta.

H. striata Drap. In consequence of this specific name being generally conceded to Müller's shell, *H. profuga* Schmidt has been adopted for the species under consideration. Some day the question will have to be decided as to the limits within which *H. variabilis* Drap. (our British *H. virgata* Da Costa) is to be allowed to vary. Capt. Becher makes it synonymous with *H. cespitum* Müll. Any one who would work out the bewildering series of names inflicted on *H. variabilis* by various authors would be a public benefactor.

H. melitensis Fer. Dr. Kobelt, who made large collections of Iberus in Sicily, will no doubt have something to say about this shell. It may prove to inhabit Sicily also.

H. Erdelii Roth. See Paulucci's 'Fauna Malacologica della Calabria,' p. 60, where it is shown that this shell, and its synonym *H. flavida* Ziegl., should more properly be called *H. Balmei* Pot. and Mich.

Zonites cellarius Müll. This is not the time to raise the question as to the relative merits of the terms 'Zonites' and 'Hyalina,' nor to enquire whether Rossm.'s *H. hydatina* is or is not distinct from *H. crystallina.* It may,

however, be mentioned that Dr. Boettger lately made out that some Maltese specimens of this genus, which had been previously considered to be *H. cellaria*, should be called *H. Draparnaldi* var.

Clausilia syracusana Phil. The Maltese shell is generally separated from the Sicilian under the name of *C. oscitans* Fér., of which *C. mamotica* Gulia and *C. scalaris* Pfeiffer (*C. delicatæ* Gulia), are given as sub-species by Boettger, who has also lately described another species from Malta, under the name of *C. imitatrix* ('Jahrb.,' vi. p. 120, t. 3, fig. 14).

Cyclostoma melitense Sow. would appear to be rather a variety of *C sulcatum* Drap. than of *C. elegans.* Both these species inhabit Sicily. See 'Pfr. Mon. Pneum.,' 3rd supplement, p. 179, where *C. sulcatum* appears as *C. buccinulum* Bott.

It only remains to add that the writer will be most happy to receive any remarks from persons interested in the subject, and to shew them such specimens as his collection contains.

4, Halkin Street, Grosvenor Place.

NOTE ON *EULIMA CANDIDA* OF MARRAT.*

By EDGAR A. SMITH, F.Z.S.

Zoological Department, British Museum.

When this magnificent species was described, its exact locality, a desideratum which I am now able to supply, was unknown. Through the liberality of the Rev. R. W. J. Smart the British Museum has recently become possessed of two very fine specimens which he informs me came from the Island of Formosa, off the coast of China. Judging from these shells the upper and right-hand figures given by Marrat are not quite correct, for only the lower part of the continuous ascending

* Proceedings of the Liverpool Philosophical Society, Liverpool, 1880, p. 339.

line of former labra is visible when the aperture of the shell is towards the eye, and it passes much more obliquely across the spire than is represented in the figures referred to. Although not extending in an uninterrupted line from the body-whorl to the spire, still the old lips, even on the topmost normal volutions, are visible under the lens, but at irregular intervals, as is also the case in *E. Martinii* A. Adams. Mr. Marrat, however, is quite right in regarding this species as distinct, and I only regret that he has imposed a name upon it which applies nearly to every species in the genus, and indeed I feel almost tempted to re-name it (after my friend), a practice, however, not to be commended except in very exceptional instances.

Obituary.—John Gwyn Jeffreys, LL.D., F.R.S., &c.

The chief authority on the Mollusca of European and Arctic Seas is no more. Dr. Gwyn Jeffreys died after only a few hours' illness on Saturday, January 24th. This veteran conchologist, who was hale, hearty, and in full vigour of mind to the last, had just entered his 77th year. For nearly sixty-five years he had been engaged in the study of conchology, and increasing years had not diminished but rather heightened his ardour as a collector and a student. Dr. Gwyn Jeffreys was essentially a conchologist. He did not deeply study such groups as the Limacidæ, the Nudibranchiata, or the Cephalopoda; but as an authority on the shells of the North Atlantic he stood *facile princeps*. The knowledge he possessed he was always ready to use for the benefit of others. It was his delight to lend a helping hand to tyros and assist young conchologists in the determination of their specimens, and no small portion of his time was occupied in this kind of work. Many of our subscribers, as they read these lines, will realise how kind and sympathising a friend they have lost in him who had so often and so good naturedly helped them in their difficulties. For fifty-six years Gwyn Jeffreys had been writing on the mollusca,

and some of his earlier papers, such as those on the difficult genus Odostomia, and on the Marine Testacea of the Piedmontese Coast are still valuable. In the preparation of their great work, "A History of British Mollusca and their Shells," Forbes and Hanley owed much to the hearty co-operation of Gwyn Jeffreys. They dedicated their work jointly to him and Alder, and in their preface wrote: "The invaluable and classical collection of British shells in the possession of Mr. Gwyn Jeffreys, and the experience of its liberal proprietor, placed within the reach of that energetic investigator, materials for a work like this, such as no other naturalist could command, but the imperious demands of professional avocations withheld the leisure [to undertake the work], where there was both will and ample knowledge. . . . The choicest specimens in Mr. Jeffreys' cabinet have been placed at our disposal for figuring." The leisure which Dr. Gwyn Jeffreys then lacked was found in later years, and to it we owe his five-volume work, "British Conchology." Dr. Gwyn Jeffreys in this work tried to popularize conchology, and make his pages pleasant reading by introducing much matter which was not technical or absolutely necessary. But one misfortune which attended this was the lengthening of the work and the consequent increase in the price, which placed it beyond the means of purchase of many working conchologists.

Mrs. Jeffreys died a few years ago. Although she did not share her husband's tastes, she was indirectly of great help to him in his pursuits. Clever, well read, and accomplished, she was an excellent hostess, who always made pleasant and agreeable the stay of the scientific men whom Gwyn Jeffreys delighted to hospitably entertain when living at Ware Priory; and, being a very good linguist, was often of no small use to him as interpreter.

Gwyn Jeffreys' matchless collection, which contains not only the proceeds of his own constant labour, collection, and acquisition by exchange with every known conchologist in

Europe, but also embraces many classical collections which he had purchased, such as those of Turton, Clark, and Weinkauff, has been purchased by the United States Government, and will find its resting place in the National Museum at Washington. It was offered at what was really a nominal price for purchase to the British Museum, but was declined by the authorities. That this great reference collection should be now inaccessible is a grievous loss, not only to British, but to European conchologists. The collections of the Marine Invertebrata of Europe in our National Museum are far short of what they ought to be and sadly behind the day.

A series, however, of the deep sea forms collected by the 'Lightning,' 'Porcupine,' 'Valorous,' 'Knight Errant,' and 'Triton' Expeditions will be in the British Museum, and we trust that Mr. Edgar A. Smith will complete in the 'Proceedings of the Zoological Society' that portion of the publication of the species procured in the two first named expeditions which unfortunately remains unfinished at the time of Dr. Gwyn Jeffreys' death, but for the completion of which he left ample materials.

THE MARINE SHELLS OF SCILLY.

BY

THE REV. R. W. J. SMART, M.A.,

LATE CURATE-IN-CHARGE OF TRESCO, SCILLY,

AND

THE REV. A. H. COOKE, M.A., F.Z.S.,

MUSEUM OF ZOOLOGY AND COMPARATIVE ANATOMY, CAMBRIDGE.

The marine zoology of the Scilly Islands must always, from the geographical situation of that group, be an object of extreme interest. It seems remarkable that no list of Scillonian mollusca of any scientific value has as yet been published, and that no very systematic attempt has been made to ascertain the resources of the seas surrounding the isles, in this branch of science.

The earliest recorded dredging work among the islands was done by Lord Vernon about a quarter of a century ago. A list

of Scillonian mollusca is kept at Tresco Abbey, in which the species found by Lord Vernon were once distinguished by a special mark. This list has received subsequent additions from various hands—some of them manifestly unscientific—and the result has been to import into the list not a few species whose true habitat is obviously very distant from Scilly.

Dr. Jeffreys informs us that Mr. Barlee at one time dredged in Scilly. Considerable and trustworthy additions were made to the Abbey list by the Rev. J. H. Jenkinson, and also by his son, F. H. Jenkinson, Esq., of Trinity College, Cambridge. These additions, if of shells which we were not able to confirm ourselves, are printed in a separate list at the end of ours, and may be taken as authentic.

A third list contains those shells which are on the Abbey list, but are confirmed neither by Mr. Jenkinson's nor our own researches, and therefore must be regarded generally with considerable, and in certain obvious cases with complete mistrust.

But it will be seen how much room there was for work on the subject when we mention that among thirty-six species now appearing for the first time as Scillonian, so abundant a shell as *Littorina neritoides*, living in a habitat specially accessible, had appeared in no list before the present.

Perhaps the shells which do not occur on the list are as interesting as those which do. The more prominent absentees are *Mactra stultorum*, *Tellina balthica*, *Donax anatinus*, *D. politus*, *Mya arenaria*, *M. truncata*, *Solen ensis*, *Natica monilifera*, and *Calyptraea chinensis*. Most of these might fairly have been expected to occur in the sandy bays which abound, but they are either entirely absent, or, as will be seen from the additional lists, have occurred as solitary individuals some years ago, and have never made their appearance since. *Tellina balthica*, as an estuary shell, might fairly be excused occurring, but curiously enough *Scrobicularia piperita*, much more of an estuary shell than the Tellina, does occur. None of the Pholas tribe are found in the Scilly Islands, the hard granite offering them no chance of lodgement.

The comparatively southern latitude of these islands is illustrated by the extreme scarcity of such shells as *Buccinum undatum*, *Fusus gracilis*, *F. antiquus*, and *Littorina littorea.*

Dredging at Scilly is not altogether an easy matter, considering the available appliances. Roughly speaking, the work is done on ground of the following nature:—The channels which separate the larger islands from one another are shallow, some, as St. Martin's Flats, being left almost bare at low water of spring tides; others, as Crow Sound, being about 8—10 fms. deep, with a bottom of muddy sand. Outside the islands the water deepens almost immediately, sinking rapidly to about 40—50 fms., which is in fact a portion of the sea bottom, always within the 100 fm. line, which extends in every direction outside the South British Channels until the edge is reached of the great Atlantic depths.

The bottom alternates from rough gravel to shelly sand, with stones here and there, but is on the whole very uniform in character, and in the shells it produces. The best ground, as will be seen from the list which follows, is outside the rock known as Menavawr, about half a mile to two miles N. to NE., in about 35—40 fathoms. But as this ground is practically in the open Atlantic, it is not by any means possible always to work it, as a very little wind raises sea enough to prevent the dredge keeping the bottom at such a depth, while even if there is no wind there will frequently be enough ground sea to produce a similar or more fatal result. Nearly all our deep sea work was done outside Menavawr, and no doubt if the ground more to the southward of the islands were dredged systematically, several new species might be added to the list.

It will be seen therefore that this list has no pretensions to completeness, but simply represents what may be done by a very limited amount of dredging, combined with (on the part of one of us) tolerably close shore hunting for about four years.

Anomia ephippium L.—Full-grown specimens rare, young shells common on sea weed; all the varieties occur, and one not noticed by Jeffreys, in which the beaks are remarkably prominent.

Ostrea edulis L.—Rare. Odd valves occasionally thrown up. An attempt was made, fifteen or twenty years ago, to introduce the species, but without success.

Pecten pusio L.—Young specimens dredged in forty fathoms, gravel, outside Menavawr Rock.

P. varius L.—Same ground as *P. pusio*, but not so abundant.

P. opercularis L.—Young specimens common under stones, and on seaweed at low water mark; also in stony ground outside Menavawr; full grown specimens very rare, on Zostera beds with *P. maximus*; also adhering to the bottom of a coal hulk off South End of Tresco.

P. tigrinus Müll.—Not uncommon in stony ground outside Menavawr.

P. tigrinus var. **costata** Müll.—With the type.

P. similis Laskey.—Not uncommon in certain places outside Menavawr, but local and rather small.

P. maximus L.—Common on Zostera beds at low water mark of spring tides inside the islands. Obtained by observing the spot where a jet of water is thrown out by a sudden closing of the valves, otherwise no amount of searching would discover them.

Lima Loscombii Sby.—Living specimens rare, single valves tolerably common outside Menavawr.

L. hians var. **tenera** Gmel.—Single valves only, with *L. Loscombii*.

L. subauriculata Mont.—One or two valves only, with *L. hians*.

Pinna rudis L.—In Zostera beds at low water mark, spring tides, with *P. maximus*, but by no means numerous, and difficult to find, since the edge of the shell only stands about an inch above the mud, and is often enveloped in, or overgrown by weed.

Mytilus edulis L.—In the crevices of the outer rocks all round the islands, but scarcely common, and always solitary and small.

M. modiolus L.—Occasionally thrown up.

M. barbatus L. — Dredged outside Menavawr, frequently attached to sea weeds, but always very small specimens.

M. Adriaticus Lam.—Dredged off Menavawr, in a nest or case; also occasionally thrown ashore dead.

Modiolaria marmorata Forbes.—A few single valves.

M. costulata Risso.—Trawl refuse and dredged, always attached to seaweeds, with *M. barbatus*.

Crenella rhombea Berk.—Single valves dredged in forty fathoms sand, but rare and local.

Nucula nucleus L.—Not rare in the gravel from outside dredgings.

Pectunculus Glycimeris L.—Small specimens common, especially in forty-fathom dredgings on stony ground; large specinens very scarce, but occasionally thrown up.

Arca lactea L. — Occasionally met with in forty-fathom dredgings.

Arca tetragona Poli.—Very large single valves, over 1·25 in. broad, occasionally thrown up; small single valves abundant, with *A. lactea*, and far more common. Sometimes obtained alive when large stones are brought up by the dredge.

Montacuta bidentata Mont.—Dredged in 8 fms., fine sand, Crow Sound, common.

M. ferruginosa Mont.—With *M. bidentata*, and equally abundant.

Lasea rubra Mont.—Golden Ball bar: would probably be found commonly if properly searched for.

L. rubra var. **pallida** Mont. — Rocks under Cromwell's Castle.

Kellia suborbicularis Mont.—Dredged in 40 fms., and

found under stones on St. Martin's Flats, but never common.

Loripes lacteus L.—A few specimens from St. Martin's Flats, but never taken alive.

L. divaricatus L.—Single, but fresh valves, not uncommon in 8—10 fms. muddy sand, Crow Sound. The occurrence of this shell in a new but unquestionable British locality, is very interesting. It is true that no living specimens were discovered, but many of the valves were undoubtedly fresh, and we have no doubt that by persistent dredging living specimens would eventually be procured. The ligament in this subgenus of *Lucina* is extremely frail, which will account for no double shells occurring; the same was the case with *Axinus flexuosus* which occurred on the same ground, in quantity, and of which only one living specimen was obtained in many hauls of the dredge. We were generally tolerably sure of at least one valve of *L. divaricatus* to every haul.

Lucina borealis L.—Exceedingly common on St. Martin's Flats, fine large specimens; also dredged outside Menavawr.

Axinus flexuosus Mont.—Crow Sound in 8—10 fms. muddy sand; living specimens very rare, valves exceedingly common.

Diplodonta rotundata Mont.—A few specimens on St. Martin's Flats, dead but perfect.

Cardium echinatum L.—Dredged living in Crow Sound, but only young specimens: not as yet found full-grown except in fragments.

C. fasciatum Mont.—From the Menavawr dredgings; not common.

C. nodosum Turt.—With *C. fasciatum*, but more abundant, and frequently living.

C. edule L.—Sandy bays and flats everywhere; raked out of the sand by the inhabitants for food.

Cardium edule var. **crenulata** L.—A form approaching this

variety occurs abundantly in the neighbourhood of Pentle Bay.

C. Norvegicum Spengl.—Not uncommon alive on Pentle Bay and St. Martin's Flats.

Cyprina Islandica L.—Very young specimens only, Crow Sound.

Astarte sulcata DaCosta.—Rare; from the deep water outside Menavawr, two living specimens only were obtained, and about a dozen single valves.

A. triangularis Mont.—With *A. sulcata*, but very abundant; smaller than usual.

Circe minima Mont.—With *A. triangularis*, common, and often finely marked.

Venus exoleta L.—Exceedingly common in sandy bays everywhere.

V. lincta Pult.—St. Martin's Flats and Pentle Bay; seldom found alive.

V. chione L.—Not uncommon in clean sand: St. Martin's Flats and Pentle Bay, often very large and beautiful, living at low water mark spring tides. This habitat is noteworthy, as Jeffreys only gives it from sand in 12—25 fms.

V. fasciata Da Costa.—Common in sand at low water mark, Pentle Bay, St. Helens, etc.; also dredged in 40 fms. gravel, outside Menavawr. Shore specimens are always very thick, ribs broad and obscure; dredged specimens much flatter and cleaner cut, ribs sharp and more numerous.

V. fasciata var. **radiata** DaCosta.—Several fine specimens from the deep water dredgings, also littoral.

V. casina L.—Common at the north end of Pentle Bay, living in clean sand at low water mark, also on St. Martin's Flats, and between Tresco and Bryher. Here again the habitat is worth notice, Jeffreys only giving 5—90 fms.

V. verrucosa L.—Found occasionally in the sandy bays, but never common.

V. ovata Penn.—Common from the deep water dredgings, of good size and colour.

V. gallina L.—Not common, sometimes living along the shore, and from the Crow Sound dredgings.

Tapes aureus Gmel.—Abundant on St. Martin's Flats and both sides of Tresco, of fine size and colour: the commonest of the Tapes.

T. virgineus L.—Fairly common with *T. aureus*.

T. virgineus var. **sarniensis** L.—One or two specimens.

T. pullastra Mont.—With *T. aureus*, especially between Tresco and Bryher; not quite so abundant.

T. decussatus L.—The least common species of Tapes; only to be found in any number at a certain spot on Tean.

Lucinopsis undata var. **æqualis** Penn.—The type does not occur, the variety is found sparingly on St. Martin's Flats.

Tellina crassa Penn.—Very abundant in clean sand near Pentle Bay, especially where the sand was channelled into heaps by the retiring tide.

T. crassa var. **albida** Penn.—With the type, common.

T. tenuis DaCosta.—Very scarce, two or three specimens only occurred, thrown up on the sandy beaches.

T. fabula Gron.—Rare, from Crow Sound, only two or three perfect specimens.

T. squalida L.—Alive on St. Martin's Flats, but perfect specimens very scarce, single valves common from the dredging in Crow Sound.

T. donacina L.—Sparingly found in all the sandy bays, never abundant.

T. pusilla Phil.—In clean sand, low water mark, ordinary tides: Pentle Bay and St. Martin's Flats; local, but not uncommon.

Psammobia tellinella Lam.—Living with *V. fasciata* in Pentle Bay; indeed it is common all round the shores in

sandy gravel, also from the deep-water dredgings on similar ground.

P. costulata Turt.—With *P. tellinella*, but much less common.

P. Ferroensis Chem.—St. Martin's Flats, fairly common, living at low water mark, spring tides.

P. vespertina Chem.—Sparingly found in all the sandy bays, living at low water mark, but never very abundant.

Amphidesma castanea Mont.—Any quantity of single valves from the Menavawr and Crow Sound dredgings; the ligament being tender, perfect specimens are rare.

Mactra solida L.—Not abundant, but fairly distributed in most of the sandy bays.

M. solida var. **truncata** L.—With the type; fairly common in Pentle Bay.

Another well-marked variety occurs, intermediate between the type and var. *truncata*.

M. solida var. **elliptica** L.—With var. *truncata*.

M. subtruncata DaCosta.—Same localities as the preceding, but not so common.

Lutraria elliptica Lam.—Common in sand everywhere at low water mark; often very large.

Syndosmya prismatica Mont.—Crow Sound, in 8 fms., muddy sand; also inside Round Island on a similar bottom. Common.

S. alba Wood.—With *S. prismatica*, equally common.

Scrobicularia piperata Bellon.—Seldom found except in one bay (Porth-hellick), on St. Mary's.

Solecurtus candidus Renier.—Not uncommon alive in clean sand, at low water mark, in the neighbourhood of Pentle Bay.

Solen pellucidus Penn.—Numerous in 8 fms. muddy sand, Crow Sound and inside Round Island.

S. siliqua L.—In sand at low water mark.

Pandora inaequivalvis var. **obtusa** L.—Two specimens only from the Menavawr and Round Island dredgings.

Thracia prætenuis Pult.—Living in sand, low water, spring tides, St. Martin's Flats, but very rare.

T. papyracea Poli.—Abundant in the sandy bays.

T. distorta Mont.—Four or five single valves from St. Martin's Flats and dredgings.

Corbula gibba Olivi.—Gregarious in muddy sand, Crow Sound and elsewhere.

Saxicava rugosa L.—Under rocks below Cromwell's Castle, and probably everywhere; also dredged outside Menavawr.

S. rugosa var. **arctica** L.—Plentiful in deep water dredgings.

Venerupis Irus L.—Three valves only; one off beach at Guthers, two from deep dredgings.

Gastrochœna dubia Penn.—A single valve from the Menavawr dredging.

Xylophaga dorsalis Turt.—One valve only, with the preceeding.

Dentalium entalis L.—Three or four specimens from muddy sand, Crow Sound.

Chiton cinereus L.—From the Menavawr dredgings, on stones and old shells, not uncommon.

C. marginatus Penn.—Under loose stones on the shore; not common.

Patella vulgata L.—Exceedingly abundant everywhere, and of every shape and size.

P. vulgata var. **depressa** L.—With the type.

Helcion pellucidum L.—On Laminaria, fairly common.

Tectura virginea Müll.—From the Crow Sound dredgings, and thrown up on the beaches, but apparently not occurring alive above low water mark.

Emarginula fissura L.—Common from the 40 fms. Menavawr dredgings, but never in a living state.

E. rosea Bell.—With the above, but very much more scarce.

Fissurella Græca Don.—With the above, but never alive.

Capulus Hungaricus L.—Very young and dead specimens only; with the above.

Trochus magus L.—Common in dirty sand, at low water mark, in all the bays and flats. The var. *alba* also occurs.

T. tumidus Mont.—Common from the Menavawr dredgings.

T. cinerarius L.—Abundant under stones and sea weeds everywhere.

T. umbilicatus Mont.—With the above, often very clean and finely marked.

T. lineatus Da Costa.—Very common at half-tide mark all round the shores. Eaten as 'Wrinkles' by the inhabitants.

T. montacuti Wood.—With *T. tumidus*, but not nearly so common.

T. striatus L.—Swarming on all the Zostera beds.

T. millegranus Phil.—One specimen only, with the following variety.

T. millegranus var. **pyramidata** Phil.—Rather common from the Menavawr dredgings; colour pure white, a very pretty shell, occurring with a white var. of *zizyphinus*, from which it is distinguished at once by its granulated surface.

T. granulatus Born.—A few dead and imperfect specimens only, from the Menavawr dredgings.

T. zizyphinus L.—Under stones at low water mark everywhere, but not very common.

T. zizyphinus var. **Lyonsii** L.—Golden Ball Bar, under stones and in rock pools overhung by rocks, abundant, but never to be found without dislodging many loose stones, or peering under massive ledges of rock; also dredged with *T. millegranus* var. *pyramidata* outside Menavawr but never so large as shore specimens.

Another variety occurred on Golden Ball Bar in which the markings of the type form were uniformly lighter, without a trace of purple.

Phasianella pullus L.—Abundant on Zostera in the roads, with *Rissoa membranacea.*

Lacuna crassior Mont.—Two dead specimens from the deep water dredgings.

L. pallidula DaCosta var. ?—One specimen from the inner Channel, two from deep water.

Littorina obtusata L.—Swarming on sea weed everywhere at half-tide mark.

L. neritoides L.—Outer rocks only, often remarkably fine and clean; they seem to take their colour from the rock they inhabit.

L. rudis Maton.—Exceedingly abundant everywhere.

L. rudis var. **sulcata** Maton.—Abundant and especially fine, more so where the sea weed is yellow, furrows not purplish brown but black. Other varieties occur, but this is the most marked.

L. littorea L.—Two specimens only, found living on east shore of Bryher, with *T. lineatus*; very rare, but possibly careful search amongst thousands of *T. lineatus* might discover more.

Rissoa cancellata DaCosta.—Menavawr dredgings, not very common.

R. Beanii Hanley.—Also from the deep water; not rare.

R. punctura Mont.—With the above; abundant.

R. Zetlandica Mont.—This rare and very pretty shell was found sparingly in the same habitat as the preceding.

R. costata Mont.—With the above; not rare.

R. parva DaCosta.—All round the shores, and from the deep water, every shape and size.

R. parva var. **interrupta** DaCosta.—Sandy shores, and in Crow Sound dredgings, never from deep water.

R. membranacea Ads.—Very abundant on Zostera beds with *Trochus striatus* and *Littorina obtusata.*

R. striata Ads.—Common everywhere, low water mark to 40 fms.

R. vitrea Mont.—Dead specimens only from Crow Sound, common.

R. cingillus Mont.—On weed in trawl refuse from shallow water, and under stones on the shore.

Barleeia rubra Ads.—Deep water dredgings, never living, fairly common.

Turritella terebra L.—Living, in muddy sand, Crow Sound; sometimes thrown up on a beach at the west of Bryher.

T. terebra var. **nivea** L.—Dredged with the type.

Scalaria Turtonae Turt.—A fragment only, dredged outside Menavawr.

S. communis Lam.—Living on gravelly sand at low water mark, Cheese Rock, and occasionally thrown up dead on all the beaches.

S. clathratula Adams.—From the Menavawr dredgings; also has been obtained thrown up on the shore, never alive.

Odostomia clavula Lovén.
O. pallida Mont.
O. conoidea Brocchi.
O. conspicua Alder.
O. unidentata Mont.
O. turrita Hanley.
O. insculpta Mont.
O. decussata Mont.
O. indistincta Mont.
O. interstincta Mont.
O. spiralis Mont.
O. excavata Phil.
O. scalaris var. **rufescens** Phil.
O. lactea L.
O. acicula Phil.

All the preceeding species of *Odostomia* were found in the Menavawr dredgings; none being common, some represented by only a single specimen. The more critical

species have had the advantage of being determined by Dr. Jeffreys.

Ianthina rotundata Leach.—Occasionally driven on shore from the westward, on the beaches facing south-west. The Scillonians have an idea that they come in at fixed periods of about seven years. The South Wales fishermen about Tenby have the same belief. Sometimes very large specimens over 1·5 in. square have come on shore; at other times very small ones, about ·3 in. square, make their appearance. Occasionally they have occurred in such numbers that hundreds might have been collected at once. Often years pass without a single one being seen. We were fortunate enough last September to find several specimens cast on the beach at the back of Bryher, with animal and float perfect and unbroken. When placed in spirits the animal retires into the shell, drawing the float partly with it, in time the float generally becomes detached, the air bubbles escape, and a mere film of collapsed gelatinous matter is left. The last time previous to September, 1884, that the *Ianthinæ* came ashore was in the winter of 1881-82.

Eulima polita L.—Living in gravel outside Menavawr; rare.

E. distorta Desh.—Small specimens, with *E. polita*, never common, but not quite so rare.

E. bilineata Alder.—With the preceding; common, but small.

Natica Alderi Forbes.—Abundant in clean sand at low water mark.

N. Alderi var. **lactea** Forbes.—Occasional, with the type.

Lamellaria perspicua. L. — Crow Sound, only a few specimens.

Velutina lævigata Penn.—Occasionally found dead in the Menavawr gravelly sand.

Aporrhais pes-pelecani L.—Seldom occurs; has twice been found living on the shore, but never dredged.

Cerithium reticulatum DaCosta.—Living under rocks below Cromwell's Castle; abundant from the Menavawr dredgings.

C. perversum L.—With the above in deep water dredgings, common.

Cerithiopsis tubercularis L.—With the above, quite common and rather large.

C. Metaxa Della Chiaje.—About half-a-dozen dead but perfect specimens of this rare and lovely shell were found, on carefully examining the dredged sandy gravel, from outside Menavawr.

Purpura lapillus L.—Fairly common all round the rocky shores, but never clustering very thickly; the uniform colour is white: banded specimens seldom or never occur. One variety, found along the inner channels and on rocks in more sheltered places, has a very sharp and produced spire, with the whorls strongly corded, and almost a keel on the shoulder, mouth narrow, canal long; specimens occurred 1·3 inch long and only about half that breadth. Another variety, from the exposed outer rocks, is an exact opposite to this, being of a squat dumpy form, spire scarcely any, mouth large and rounded, occupying nearly ·875 of the whole shell. If these two forms only of *P. lapillus* occurred, they would certainly have been made into different species.

Buccinum undatum L.—Very old and worn shells only, washed up on the beaches; exceedingly rare.

Murex erinaceus L.—Strangely rare, never found living in the recess of the tide, once dredged alive outside Menavawr; dead shells, mostly much worn and encrusted, occur sparingly in the dredgings.

Lachesis minima Mont.—Common in gravel, from the deep water dredgings.

Trophon muricatus Mont.—Sparingly found in the deep water dredgings outside Menavawr.

T. truncatus Ström.—One dead and worn specimen with *T. muricatus*. The locality is noteworthy, Tenby being the southernmost locality given by Jeffreys.

Fusus antiquus L.—One young and dead specimen only, from the Menavawr dredgings.

F. gracilis DaCosta.—Very rare; two or three worn specimens from the beaches. Two specimens also occurred of a variety approaching *convoluta*, only the size was larger and the ridges very strong.

Nassa reticulata L.—Exceedingly abundant under Zostera, at low water mark spring tides, clustering under any piece of decaying rubbish, also in clean sand near Pentle Bay, with *Tellina crassa* and *Natica nitida*.

N. incrassata Müll.—Under stones at low water mark almost everywhere, especially at Golden Ball Bar, where we have taken a family of a dozen from one small stone; also from the deep water, common.

Defrancia teres Forbes.—Very rare, one or two good specimens from the deep water.

D. gracilis Mont.—From the Menavawr dredgings, not very rare.

D. linearis Mont.—With the above, common.

D. purpurea Mont.—Also from the deep water, but rare and not full grown.

D. purpurea var. **Philberti** Mont.—With the type, but only a fragment.

Pleurotoma costata Don.—With the preceeding, common.

P. nebula Mont.—Same locality, but not common; also from Crow Sound.

P. septangularis Mont.—Rare, a few good specimens from the gravel outside Menavawr.

P. rufa Mont.—Thrown up on the sandy beaches, rather common.

Marginella lævis Don.—Not rare from the deep water outside Menavawr and Shipman Head.

Cypræa Europæa L.—Living, from Crow Sound dredgings, and generally distributed.

Ovula patula Penn.—Dead specimens only, from Menavawr and inside Round Island.

Cylichna umbilicata Mont.—Dead specimens from the muddy sand in Crow Sound, common.

C. cylindracea Penn.—With the above, but young and remarkably slender.

Utriculus mammillatus Phil.—Guther's beach, dead, rare.

U. truncatulus Brug.—From the Menavawr gravel, very abundant.

U. obtusus Mont.—Crow Sound and from Guther's beach, but somewhat rare.

U. obtusus var. **Lajonkaireana** Mont.—With the type.

U. hyalinus Turt.—One or two specimens only, from the deep water.

Actaeon tornatilis L.—Crow Sound, and in thick mud under Round Island, but small and not common.

Bulla hydatis L.—Among Zostera at extreme low water mark, but very irregular in its habits: sometimes many occur, at others not one will be seen.

Scaphander lignarius L.—Living in mud inside Round Island; also in sand between Samson and Tresco, but never common.

Philine scabra Müll.—Dead specimens very common in muddy sand at 8 fms., Crow Sound.

Pleurobranchus membranaceus Mont.—On Zostera near Carnea at very low water.

P. plumula Mont.—Dredged in the Roadstead, St. Mary's.

Melampus bidentatus Mont.—Under stones, low water mark, Carnea; Quay at St. Mary's; dead at Guther's beach.

M. myosotis Drap.—Thrown up on beach, but very rare; never found alive.

Otina otis Turt.—Piper's Hole, Tresco, common. After many days' searching along the rocks we were rewarded by finding this species in the above locality. It no doubt

occurs elsewhere, but is very particular in its choice of a home. It is found in dark or shaded places or under ledges, just below high water mark, not on large stones, but on a face of rock, particularly where there are empty Balani and mosses, but an indispensable accompaniment to all this is a certain amount of moisture;—it is never found on dry rocks.

LIST OF SHELLS

found at Scilly by the Rev. J. H. Jenkinson and F. H. Jenkinson, Esq., but which are not in the preceding list:—

Lepton squamosum Mont.
L. convexum Turt.
Donax politus Poli.
Mactra stultorum L.
Lutraria oblonga Chem.
Mya truncata L.
Chiton fascicularis L.
Rissoa semistriata Mont.
Scalaria Trevelyana Lea.
Ianthina exigua Lam.
Philine punctata Clark.
P. aperta L.

The following are given as occurring in Scilly on authority of Jeff. Brit. Conch., but not confirmed by us:—

Pecten striatus Müll.
Akera bullata Müll.

LIST OF SHELLS

occurring in the Abbey list as Scillonian, but whose authority as such is unknown, and whose occurrence has not been confirmed:—

Anomia patelliformis L.
Modiola phaseolina Phil.
Nucula decussata Sby.
Cardium aculeatum L.
C. rusticum L.
C. pygmæum Don.
Tellina solidula Pult.
Donax anatinus Lam.
Ceratisolen legumen L.

Solen ensis L.
S. marginatus Pult.
Thracia villosiuscula Macg.
Calyptraea Sinensis L.
Trochus exiguus Pult.
Rissoa inconspicua Alder.
R. ventrosa Mont.
R. ulvae Penn.
Odostomia rissoides Hanl.
O. cylindrica Alder.
Natica monilifera Lam.
Velutina flexilis Mont.
Cerithiopsis pulchella Jeffr.
Fusus Islandicus Chem.
Nassa pygmæa Lam.
Mangelia brachystoma Phil.
M. scabra Jeffr.

Note on the preparation of the smaller Bivalves for the Cabinet.—I have adopted a plan which I think rather an improvement on Mr. Collier's method (J.C., vol. iv., p. 54). After extracting the animal I place them on a setting-board of cork, somewhat similar to those used for insects. A strip of cork, say 1 in. or 1½ in. wide, with a v shaped groove cut down the centre with a cabinetmakers' rasp, and finished off with glass-paper, I find answer the purpose admirably, the shells being placed in the groove beaks upward. A setting-board a foot long will take a good lot, and they are easily observed and compared in this position. For the larger shells any convenient crevice, such as the spaces between the strips of a greenhouse stage, will answer well.—Wm. Jeffery, Ratham, Chichester, March 9th, 1885.

PROBABLE CAUSES OF ABNORMAL VARIATION IN LIMNÆA.

By B. STURGESS DODD.

Among our water snails, we are all aware, interesting abnormal forms occasionally occur. In *Limnæa peregra* and *Limnæa auricularia* instances of strange more or less flattened expansions of the outer lip are observed, and cases occur, when after such expansions, the lip is even curled over in a most curious manner. Jeffreys has remarked, 'the consistency and even the shape of the shells in this genus appears to depend much on the nature and quantity of food, the chemical ingredients of the water, and the degree of stagnation or rapidity of its current.' To account further for these remarkable expansions it has been suggested that the pond, ditch, brook, or running stream in which they are found, may at one time, owing to deficiency of water, have left those animals in more or less confined situations in damp muddy recesses, or on dry ground, during periods of their most active growth, and that these altered conditions would favour greatly an unusual expansion of the animal's mantle while travelling in search of food at a time when active shell secretion went on.

'*Limnæa peregra* is known to be not very slow in its movements (although sluggish at times), and nearly amphibious, as its name imports,' says Jeffreys, 'and is fond of wandering, being occasionally met with at some distance from its native element, in a damp meadow, or climbing up the trunk of a willow tree.'

A temporary cessation of growth in *Limnæa stagnalis* produces a thickened lip, and in such cases varicose marks are observable on the spire at intervals.

An inner lip or rib is often formed within the shell of *Limnæa glabra*, while in *Limnæa palustris* the whorls are sometimes distorted or scalariform.

The views of others, with respect to the causes of variation in the forms of the shell of our freshwater species, would be of interest to the readers of your journal.

ON THE ORGANS OF SENSE IN THE BRITISH LAND AND FRESHWATER MOLLUSCA.

By ROBERT SCHARFF, Ph.D., B.Sc., &c.

[Read before the Conchological Society.]

In the following paper on the sensory organs of our Land and Freshwater Shells I propose to take up the organ of sight first. Although there are well developed organs of touch, which may in some cases be distributed all over the surface of the body, I intend to deal here merely with the senses of Sight, Hearing, and Smell. I may also state that I am not giving any results of original investigation, but only a succint résumé or rather a compilation of what has recently been published on this subject, without too deeply going into histological details. Only comparatively few land and freshwater shells have been examined as to the structure of their sensory organs, but from what has been done we may safely assume that the differences in the organization of the various genera are only very slight, and I shall refer to them as we go on.

The Organs of Sight.

The eye is present in all land and freshwater gasteropods, while it appears to be completely wanting in our Lamellibranchs. In some of the marine bivalves, on the other hand, such as Pecten, Cardium, and Spondylus, we find well-developed organs of sight. Thus we have to deal here simply with the eyes of the Gasteropoda.

The eyes always lie in duplicate number on the head, mostly on the top of the two great tentacles, for example, in many land shells, but in many cases at their outer base, as in Cyclostoma. In the freshwater Pulmonates, for instance in Limnæa, they lie at the inner, and in Bythinia at the outer base of the two tentacles. In all snails having four tentacles the eyes are situated at the apex of the two larger ones (except

Cyclostoma). In all those possessing only two tentacles the organs of sight lie at the base. This rule holds good for all land and freshwater shells, save the Vertigo group, in which there are only two tentacles, which bear the eyes on their apex. The eyes do not, strictly speaking, occupy the apex of the oculiferous tentacles, but are placed somewhat obliquely at their outer edge.

The nomenclature used in a description of the eye has to be borrowed from that of the Vertebrates, but it must be clearly understood that the only thing the two have in common is their *physiological function*. The anatomical structure of the vertebrate eye and that of a mollusc presents very wide differences, still it is convenient to retain the same terms in both cases.

To judge by its structure the Gasteropod eye appears to be a modification of the unicorneal eye of the Annelids and Arthropods. We may look upon it as having arisen from a ball-like structure, to the posterior part of which a nerve passes This ball assumes an elliptic shape in Paludina, or is drawn out conically behind as in Neritina. In Planorbis the conic or pear-shaped form is found to be the most constant. At its anterior portion the ball touches the skin, the cells of which are transparent so as to allow the light to fall through into the eye. We may compare this (together with the anterior part of the eye-bulb) to the cornea of the vertebrate eye, with which it corresponds in position.

As regards the optic nerve, it is sometimes united with the nerve supplying the tentacle; but it has been shown by Johannes Müller that in the genus Helix at any rate the two nerves are completely separated. The whole eye is surrounded by a structureless membrane called 'sclera,' with the exception of the point, where the nerve enters. Moquin-Tandon, using the nomenclature of the vertebrate eye, makes mention of an aqueous humour: a lens and a vitreous humour as existing in the eye of the snail. For several of the land and freshwater shells this view has subsequently been proved to be erroneous. As has been

pointed out by Leydig, there are two parts to be made out in the interior of the eye of Paludina, viz. : a vitreous humour and a lens. A similar condition holds good for Neritina and Planorbis. A good deal of doubt has been cast on the existence of a vitreous humour in Helix, and there has been much controversy about its presence. Simroth, however, who recently made very elaborate researches, was unable to discover it in *Helix pomatia*, and in all probability it is also absent in other land-shells, excluding perhaps Cyclostoma. According to Lespés, the lens is absent in *Neritina fluviatilis*.

Behind the lens we have the cup-shaped retina, forming the posterior wall of the eye-ball. The following three parts may be distinguished in the retina of Helix :—

1. A layer of rods containing pigment. (This innermost layer constitutes about one-half of the whole thickness of the retina).
2. A cellular layer.
3. A nervous layer.

This arrangement, generally speaking, appears to be applicable to all gasteropods. In Limax and Limnæa, which have been studied more minutely, the three layers have been shown to exist, but the internal one is devoid of pigment.

With regard to the physiological functions of the snail's eye, several authors have attempted experiments in order to ascertain to what degree the visionary power may be utilized. Moquin-Tandon draws an important distinction between the sight of Paludina and that of the Helices. That of the latter merely suffices to give the animal an impression of an object 5-6 mills. distant. In twilight the power of vision is increased. In Paludina, sight appears to be far more powerful. It quickly withdraws into its shell, when a large object comes within 30 centims. of the eye. These results agree pretty well with what we should expect, judging by the anatomical structure of the organ, and they have been confirmed by a number of conchologists.

Having concluded my observations on the eye, I shall now pass to the organ of hearing in the various groups of land and freshwater shells.

The Organ of Hearing.

An auditory organ or otocyst appears to be more universally present among our native shells than the organ of sight. The only one of our Lamellibranchs in which it has not been found is *Dreissena polymorpha*, but it is probable that it possesses an otocyst during youth, which becomes lost later on.

In order to demonstrate the ear, we may take a large shell like Anodon, and after having removed its valves and gills, slice away the yellowish connective tissue of the foot by means of horizontal incisions. Great care should be taken in this process for fear of damaging the pedal ganglia. Many specimens will have to be dissected before a satisfactory result is arrived at, when two small knots will be seen apparently in close connection with the ganglia. These are the ears. On account of their position near the pedal ganglia, the otocysts were commonly believed to be supplied with nerve force from them.

Lacaze-Duthiers was the first to point out the relation of the octocysts to the cerebral ganglia in Gasteropods (see 'Archives de Zoologie Experimentale,' 1872). It is only comparatively recently that a similar condition was demonstrated in bivalves. This discovery is due to Simroth. The auditory nerve runs along with the commissure from the cerebral to the pedal ganglia; before reaching the latter, however, it branches off to the ears (see fig. 3).

In the family of the Unionidæ the otocysts are surrounded by a spongy capsule, the meshes of which are filled with some fluid, presumably water and blood. This peculiar structure will be referred to again in the consideration of the physiological function of the ears.

For an examination of the more minute details of the organ of hearing, the freshwater shell *Cyclas cornea* is a very suitable

object on account of the simple construction and the large size of its octocyts.

The ear capsule is enclosed within a more or less homogeneous membrane; internally it is coated by the nervous layer, which is again followed by the cellular layer (fig. 2). The latter surrounds the cavity of the ear, which contains a fluid and one or more calcareous granules. These are the 'otoliths' or ear-stones, also present in the vertebrate ear. The otoliths are moved about in the fluid by the cilia with which the cells of the innermost layer are provided. The condition which I have just described is that presented by Cyclas. In the Unio group the cellular layer is much thicker. That this layer is ciliated is probable, but has not, to my knowledge, been definitely established. The general structure appears to be pretty much the same in Gasteropods and Lamellibranchs, excluding the Unionidæ, which are distinguished by their possessing a spongy capsule. The main differences in the ear of the two groups lie in the nature of the cellular layer. In Planorbis, Ancylus, and Limnæa the component cells of this layer are very large and few in number. Neritina has cylindrical, and Paludina as well as most Gasteropods, has cubical cells.

With regard to the otoliths, I have mentioned that they are of a calcareous nature. Their numbers are very variable. *Paludina vivipara* has only one large ear-stone. Other shells have several, and their number in some forms is enormous.

A. Schmidt has discovered a canal in Helix, Limax, and Physa leading from the auditory organ to the exterior. A similar canal has also been demonstrated in Succinea and Neritina, by Ball, who believes it is characteristic of all Gasteropods. Simroth seems to doubt the existence of such a structure. He is of opinion that the canals have been produced by the protrusion of the otoliths. The slender framework of the ear subjected to pressure under the cover-glass might have caused their formation.

It now remains to say a few words about the physiological function of the organ of hearing. The only result of the numerous experiments which have been made, chiefly by Moquin-Tandon, to test the capacity of the auditory organ, has been to prove the superiority of the Lamellibranch ear over that of the Pulmonates. The anatomical arrangement seems also in favour of this view. Such a structure as the spongy capsule of Anodon, for instance, would provide a very elastic suspension for the otocyst. The transmission of the sound-waves would consequently take place in a more uniform manner and render the ear more sensitive.

What idea should we form as to the perceptive powers of this so-called ear? Is the mollusc able to distinguish sounds or merely concussions, in order to beware of danger? The answer to these questions is not easily demonstrated by experiment, but according to several authors it would appear that many snails can emit sounds. As these sounds are no doubt in many cases meant to attract other snails, we come to the natural conclusion that they have the faculty of distinguishing sounds.

Lieut-Col. Portlock read a short note at the Eighteenth Meeting of the British Association, on this subject. He stated that *Helix aperta*, which abounds at Corfu, was remarkable for its property of emitting, when irritated, a strong and well-marked sound. The sound is distinctly audible and possesses a singular grumbling or querulous tone.

A more remarkable statement was made by T. L. Taylor, at the same meeting, on the so-called singing shells of Ceylon. It would appear that at night a loud musical noise is heard on the shore, proceeding from the bottom of the water, and caused by these shells. The sounds are said to be like those of an accordion or æolian harp, pitched in different keys.

Although these reports seem to strengthen the belief in the existence of high perceptive powers in the ear of some snails, no apparatus like that existing in many insects (Orthoptera), by

means of which they can distinguish simple musical sounds, has as yet been discovered.

The Olfactory Organ.

The presence of this organ is as yet of a more or less problematical nature, and I therefore purpose dealing with it very briefly.

With regard to the Lamellibranchs, it appears to be pretty well established that a smelling organ exists. A structure richly supplied with nerves has recently been pointed out by Spengel in several marine forms. Subsequently he also discovered the same in Anodon and other freshwater shells. Its position is just where we should expect to find it, viz.: at the hinder base of the gills. Here the water entering the shell has to pass, and can be scrutinized by the smelling organ as to its salubrious nature. It consists of a specially modified crest of epithelium, and lies close to the visceral ganglion, with which the so-called olfactory ganglion, underneath the organ of smell, is connected.

A structure occupying a similar position, viz., at the entrance to the lungs in pulmonates, was first demonstrated by Lacaze-Duthiers, and it is now known among Zoologists as 'the organ of Lacaze.' Neither its discoverer, nor Simroth, a later writer, appear to have anticipated an olfactory organ in this structure. In fact, as it does not exist in terrestrial pulmonates, at any rate not in Helix, Simroth draws rather a far-fetched conclusion. He believes that it represents a sense, whose function it is to acquaint the aquatic pulmonates, when they have arrived at the surface of the water, in order to breathe.

In the genus Planorbis it is on the left side, in Limnæa and Physa on the right. Spengel declares that there is no doubt of the olfactory nature of the organ of Lacaze, and Fol, in his treatise of the 'Development of Mollusca,' expresses a similar opinion.

Lastly, I have to mention an organ in the lung-chamber of *Parmacella olivieri*, which was described a short time ago by Simroth, and which is supposed to be a smelling organ. I am

sorry I was unable to obtain a copy of the original paper which prevents me from giving a description.

This is about all the reliable information about the olfactory organ; but in no case do satisfactory experiments seem to have been made, in order to test the physiological function of the organ.

On the other hand Moquin-Tandon's experiments, which have subsequently been repeated by Velten, are too physiological, while his anatomical investigations of the supposed organ of smell are of little value. This great French Conchologist believed that the olfactory sense resided in the tentacles. He cut off the superior or great tentacles of a *Helix hortensis* and left it starving for months under a flower pot. When the animal was taken out again, it had lost all sensation of smell. He concluded therefore that this sense was placed in the oculiferous tentacles.

Velten cut away the same two tentacles and poured a drop of turpentine or such-like substance in its path: the snail turned aside. But when he removed the small tentacles as well, the animal crept heedlessly into the corrosive fluids. This seemed to prove that both pairs of tentacles are concerned in bringing about the perception of smell. The substances, however, might easily exert an influence on the tentacles, which are well supplied with nerves, without necessarily pointing to an olfactory organ.

These experiments, therefore, are not conclusive, and it is much more probable that the organ of smell in land shells is situated either somewhere near the orifice to the lungs or within the lung chamber.

Pupa umbilicata var. **albina at Christchurch, S. Hants.**—While searching an old willow trunk in my garden for *Balia*, I found a single specimen of the above. It is new to this part of Hampshire. The same tree yielded the albine examples of *Clausilia rugosa* previously recorded.—J. H. ASHFORD, Feb. 9th, 1885.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Annual Meeting

HELD THURSDAY, JANUARY 22ND, 1885.

Mr. J. W. Taylor was voted to the Chair. The minutes of the December meeting were confirmed. Telegraphic and written communications were read from the President, Mr. G. H. Parke, F.L.S., F.G.S., who expressed his regret that on account of unforeseen circumstances he was unable to attend. Mr. Parke's address was postponed to a future meeting.

Correspondence was also brought before the meeting from several other members.

NEW MEMBER.

Miss E. R. Fairbrass, of Faversham, was nominated for membership.

DONATIONS.

The following donations were announced:—"Scientific Results of the Exploration of Alaska," Article IV., Mr. R. D. Darbishire; "Abstract of the Proceedings of the Linnean Society of New South Wales," for Sep., Oct., and Nov., 1884, the Society; a specimen of *Helix desertorum* from Egypt, Mr. W. D. Roebuck, F.L.S.

The Annual Report of the council was read by the secretary and adopted.

The Recorder presented the report of the records made in the society's books for the past year, and it was adopted.

The Treasurer brought forward the cash statement for the year, which was considered and adopted. The balance-sheet shewed: Income £10 12s., Expenditure £7 6s., Balance in hand, £3 6s., Arrears £4 5s.

The Election of Officers was next proceeded with, the following being elected:—

President—Mr. Wm. Jeffery.

Vice-Presidents—Mr. G. H. Parke, F.L.S., F.G.S.; Mr. J. W. Davis, F.S.A., F.L.S., F.G.S.; Mr. Wm. Nelson; and Mr. W. Denison Roebuck, F.L.S.

Treasurer and Secretary—Mr. Thos. W. Bell.
Recorder—Mr. W. Denison Roebuck, F.L.S.
Council—Mr. Baker Hudson; Mr. J. Cosmo Melvill, M.A., F.L.S.; Mr. Robert Scharff, Ph.D., B.Sc.; Mr. Wm. Cash, F.G.S.; Mr. Geo. S. Tye; and Mr. J. W. Taylor.

SPECIMENS EXHIBITED.

A large number of specimens were brought up for exhibition. The chairman shewed *Helix virgata* var. *depressa* from Bordeaux. Examples of *Unio margaritifera* from the river Conway at Llanrwst, were shewn on behalf of Mr. R. D. Darbishire. Mr. W. D. Roebuck exhibited shells from Malton, Hornsea, Maltby, Bath, Brimscombe near Stroud, Mount Nessing in South Essex, and Grange; also *Anodonta cygnea* from Irchester, *Limax maximus* from Horsforth, *Limax lævis* from Golspie Burn in Sutherlandshire, *Helix aspersa*, *H. arbustorum*, *H. sericea*, *H. caperata*, *H. hispida*, *H. rufescens*, *H. rotundata*, *H. aculeata*, *Clausilia rugosa*, *C. laminata*, *Zua lubrica*, *Pupa umbilicata*, *Zonites cellarius*, and *Z. alliarius* from Lindale near Grange.

THE ANNUAL REPORT.

The Committee are glad to be able to report that the work of the society for the past year shows cause for satisfaction. The usual monthly meetings have been regularly held. Papers and annotated lists have been communicated by Mr. A. W. Nichols, Mr. Baker Hudson, and Mr. Wm. Denison Roebuck. A list of the mollusca of Northamptonshire, authenticated by the society's referees, has been prepared from the society's record books by the recorder, and published.

The number of specimens that have been shown, both British and Foreign, has exceeded the exhibits of any previous year, and have included the best from several large collections. For assistance rendered in this way the society is especially indebted to Messrs. Baker Hudson, E. Pickard, J. W. Taylor, H. P. Fitzgerald, R. D. Darbishire, C. T. Musson, W. Denison Roebuck, S. C. Cockerell, and others.

In June, communications were opened with the committee of the Leeds Mechanics' Institute for the use of one of their rooms for the society's meetings, and an arrangement most advantageous to the society was made. The first meeting in the new premises was held in July.

Ten new members have been elected during the year, and there has been no withdrawals.

The society had the honour of being represented at the Meeting of the British Association at Montreal, by the President, Mr. G. H. Parke, F.L.S., F.G.S.

At the February meeting, No. VII. of the society's Rules was altered, so that FOUR Vice-Presidents may be elected annually, instead of TWO as previously; and a New Rule was adopted allowing members to affix to their names the initial letters, M.C.S.

The following additions have been made to the society's library and collection :—Proceedings of the Linnean Society N. S. W., 4 parts; Monthly Abstract of the Proceedings of the Linnean Society N. S. W., for the year; Proceedings of the Royal Society of Queensland; Journal of the Royal Society of New South Wales; Transactions of the Yorkshire Naturalists' Union, part vii., 1882; Annual Report of the Smithsonian Institute for 1881 and 1882;—presented by the various societies. An Address delivered before the British Association by Lord Rayleigh, 1884; Second List of Members and Associates at the British Association Meeting, 1884; Programme of Business of the American Association for the Advancement of Science, 1884;—presented by Mr. G. H. Parke, F.L.S. Monograph of the Land Shells of Tasmania, presented by Mr. R. D. Darbishire, B.A.; and specimens of *Valvata piscinalis* var. *sub-cylindrica* and *Limnæa stagnalis* var. *labiata*, by Mr. W. Jeffery.

The question which now calls for the attention of the council and members is the want of suitable accommodation for the numerous specimens which have from time to time been presented to the society, as it is very desirable that they should be made more conveniently accessible to the members.

DESCRIPTION OF TWO NEW SPECIES OF SHELLS.

By J. COSMO MELVILL. M.A., F.L.S.

[Read before the Conchological Society].

Scalaria inclyta Melvill, n. sp., pl. xi., fig. 1.

Shell very broadly pyramidal, deeply and widely umbilicated, white between the varices, whorls united except so far as the space occupied by the three last varices is concerned. The varices are very numerous, continuous, aculeated near the suture. Length 1·50 in.

For many years I have had the above species in my collection, with the manuscript name as now given above. From *S. neglecta* Ad. and Reeve, its nearest congener, it differs in the following important particulars: the deep and wide umbilicus, the want of colour between the varices (which is pale fawn-colour in all the specimens of *S. neglecta* I have seen), the more numerous varices, and the whorls being united—this last forms a very striking distinctive feature. The specimen came into my hands in 1873, at the sale of the Norris collection. Locality unknown, but probably the China Seas.

Bullia pura Melvill, n. sp., pl. xi., fig. 2.

Shell subulate, delicately and spirally striated throughout, pale straw-colour, only slightly thickened at the sutures, inner lip simple, not callous. Length 1·25 in. Locality Port Elizabeth, S. Africa.

Distantly allied to *B. Taheitensis* Gray, belonging to the section Leiodomus Swainson. The delicate striæ impart a very neat and chaste appearance to the shell.

I obtained it in January, 1884, at the sale at Messrs. Stevens' rooms of part of Mr. C. P. Gloyne's collection, Mr. E. A. Smith has shewn us two other specimens in the Coll. Mus. Brit. also labelled Port Elizabeth. It forms an interesting addition to a somewhat circumscribed genus.

LAND SHELLS AT DOG'S BAY, CONNEMARA.

[Read before the Conchological Society].

In 1865 while I was staying at Roundstone for the purpose of dredging in the neighbouring seas, and also of collecting—literally—bags full of foraminifera from the since celebrated beach of Dog's Bay, I found in the face of the small cliff or section of sand hill closing the beach to the eastward, an old sward. This appeared as a black band about two inches thick between blown sand below and above. When I was there no such recent sward appeared near this spot. The sandy flat above and extending to Gorteen Bay on the east was all but bare of vegetation, and apparently yielding to every blast that swept across the isthmus. This sand was noticeably sand mixed with comminuted shells. On the surface there was a number of marine shells and of *Helix aspersa*, *H. nemoralis* and *H. ericetorum*, all much worn by the blown sand.

The *H. nemoralis* shells were remarkable for size, for elevation, and in many cases for a heavy lip and for a certain folding inwards of this lip near the suture, amounting in one specimen to a sort of tooth.

A remarkable feature of this superficial deposit was the preponderance of shells of *Purpura lapillus*. These did occur nearly whole, but were mostly broken (probably by frost) into small fragments, all bleached snowy white.

The black band attracted attention by showing many small Helicidæ, and I brought away a bag-full for search. It yielded the following species:—

Vitrina pellucida Müll.
Zonites nitidulus (Drap.).
Z. purus (Alder).
Z. crystallinus (Müll.).
Helix aculeata Müll.
H. nemoralis var. **libellula** Risso.
H. rufescens Penn.
H. concinna Jeff.

H. virgata Da Costa.
H. ericetorum Müll.
H. pygmæa Drap.
H. pulchella Müll.
Pupa marginata var. **edentula** Moq.
Vertigo substriata (Jeff.).
V. angustior Jeff.
Clausilia rugosa (Drap.).
Cochlicopa lubrica (Müll.).
C. lubrica var. **lubricoides** Fer.
Carychium minimum Müll.
Acme lineata (Drap.).

Helix pulchella, *Vertigo angustior*, and *Carychium minimum* occurred in great abundance.

Unfortunately I did not find and test a living sward in the neighbourhood. R. D. DARBISHIRE.

The Collector's Manual of British Land and Freshwater Shells, containing figures and descriptions of every species, an account of their habits and localities, hints on preserving and arranging, etc.; the names and descriptions of all the varieties and synoptical tables showing the differences of species hard to identify, by LIONEL ERNEST ADAMS, B.A.; illustrated by Gerald W. Adams and the author.

This little book aims to supply the beginner in Conchology with instructions for the collection, identification, and systematic arrangement of the land and freshwater shells of the British Isles. As a means of facilitating the naming of the species composing the difficult genera, Zonites and Vertigo, the author has framed synoptical tables of the differences between the most closely allied species of these groups. The work is modelled upon the late Dr. Jeffreys' 'British Conchology,' from which work the present volume is mainly compiled. There are nine plates, on which every species is figured, and in addition, the apertures of the Clausiliæ, &c., are shown on an enlarged scale; all the illustrations are engraved on copper plate. At the end of the work is a very useful glossary of the most commonly used technical terms, and an index to the plates and text. We trust this little work will foster and extend the growing taste for the study of our land and freshwater shells, as the low price 5/6, at which it is published, places it within the reach of everyone.—J.W.T.

CENSUS
OF THE AUTHENTICATED DISTRIBUTION OF BRITISH LAND AND FRESHWATER MOLLUSCA.

By JOHN W. TAYLOR and W. DENISON ROEBUCK, F.L.S.

Read before the Conchological Society, April 16th, 1885.

With the view of facilitating the labours of the numerous conchologists and others who are throughout the United Kingdom assisting us in working out the detailed distribution of the British land and freshwater mollusca, and also of those who may hereafter be disposed to assist us by submitting specimens for authentication and record, the following 'census' has been framed. It is is strictly limited to 'authenticated' records, that is to such as are verified by specimens which have passed under our own examination. This process secures uniformity of value in the results.

The numbers are those of counties and vice-counties, as shown on the map which accompanies this article, and defined and explained in the 'Journal of Conchology' for April 1884, at pp. 174—184 of the present volume. It will be seen that the Channel Islands are denoted by the cypher 'o' and that they precede district No. 1. The total number of counties and vice-counties for which we have seen specimens is given under each species.

For the present the distribution of the varieties cannot be given, and some of the doubtful species—such for example as the mythical *Arion flavus*—are also omitted.

Conchologists and naturalists generally are requested to aid in filling up the gaps in the records by sending up specimens for authentication and study. They will not fail to note how very imperfectly the mollusca of Scotland and Ireland are recorded.

The localities of such foreign specimens as we have seen are also inserted.

Testacella maugei Fér. Three counties.

Eng. S. 6 34. Irel. 145. No records for Wales, Eng. N., or Scotland.

T. haliotidea v. scutulum Sow. Thirteen counties.

Eng. S. 10 14 15 20 21 23 27 37. Wales, no records. Eng. N. 56 58 61 66. Scot. 86. Irel. no records.

Gibraltar.

Arion ater (L.). Forty-six counties.

Eng. S. 1 3 5 6 11—13 16 17 20 21 24 32—34 37—39. Wales 41 45 48—51. Eng. N. 54—57 59—66 69. Scot. 81 86 90 107—109. Irel. 114 115 145.

Pau, Heidelberg, Baden Baden.

A. hortensis Fér. Forty-four counties.

Eng. S. 1 5 6 11—13 16 17 20—22 24 32—36 38 39. Wales 41 48—52. Eng. N. 53—59 61—66 69. Scot. 86 90 107 109. Irel. 145.

Geomalacus maculosus Allm. One county.

Is found only in county Kerry.

Amalia gagates (Dp.). Six counties.

Eng. S. 5 11 14 21 36. Eng. N. 66. No records for Scotland, Wales, or Ireland.

Amalia marginata (Müll.). Sixteen counties.

Eng.S. 1 5 6 11 12 15 16 20 21 33—35. Eng.N. 53 62 64. Irel. 145. No records for Wales or Scotland.

Limax agrestis L. Forty-seven counties.

Eng. S. 1 5 6 11 12 15—18 20 21 24 31—34 36—39. Wales 41 48—52. Eng. N. 53—59 61—67 69. Scotl. 81 90 107 109. Irel. 114 145.

Limax lævis Müll. Eleven counties.

Eng. S. 11 16 21. Wales 51. Eng. N. 56 63—66. Scotl. 107 109. No records for Ireland.

Limax flavus L. Eighteen counties.

Eng.S. 1 5 6 11—13 15 20 21 33 37 38. Eng.N. 56 61 62 64 66. Irel. 145. No records for Wales or Scotland.

Gibraltar.

L. cinereo-niger Wolf. Two counties.

Eng. N. 64. Scotl. 107. No records for England S., Wales, or Ireland.

L. maximus Auct. Thirty-seven counties.

Eng. S. 1 5 11—13 15—17 21 24 32—34 36—38. Wales 49 50. Eng. N. 53 55—59 61—66 69. Scotl. 75 81 90 107. Irel. 114 145.

Lehmannia arborum Bouch. Twenty-eight counties.

Eng. S. 1 2 11—13 18 20 23 27 33 34 37 38. Wales 48—50. Eng. N. 56 57 62—66. Scotl. 81 107 109. Irel. 115 145.

Succinea putris L. Forty-five counties.

Eng. S. 0 6 11—17 19—21 24 29 31—35 38 39. Wales 41 44 45 49—52. Eng. N. 53 54 56—59 61—67 69. Scotl. 73 89 90. No records from Ireland.

Bordeaux; Burgos; Salzburg. Muscatine, Iowa, as *S. ovalis* Say.

S. elegans Risso. Twenty-five counties.

Eng. S. 0 6 10 11 13 15—17 20 21 23 32—34. Wales 44 45 50. Eng. N. 56—58 61—64. Scotl. 73. No records from Ireland.

Columbia, Pa.; Westbrook, Me., High Bluff, Carberry and Brandon, Manitoba.

S. virescens Morel. Five counties.

Eng. S. 12 16 21 37 38. No records from Eng. N., Wales, Scotland, or Ireland.

S. oblonga Drap. Three counties.

Wales 41. Scotl. 84. Irel. 147. No records for England.

St. Moritz (Switzerland).

Vitrina pellucida Müll. Thirty-nine counties.

Eng. S. 1 6 11—17 20 22 23 32—34 37 39 40. Wales 41 45 48 49 52. Eng. N. 56 57 61—67 69 71. Scot. 81 89 90 107 109. No records for Ireland.

Acireale, Sicily; New York; Peak's Island, Maine, and Carberry, Manitoba; Madonie, Sicily.

Zonites cellarius (Müll.). Fifty-four counties.

Eng. S. 0 1 3 5 6 8 9 11—13 16—18 20—22 32—35 38—40. Wales 41 43 45 48—52. Eng. N. 54 56—58 61—67 69—71. Scot. 73 77 81 83 89 90 107 109. Irel. 145.

Malta; St. Helena; rejectamenta of Swiss R. Aar; Sydney; Bordeaux.

Z. alliarius (Miller). Forty counties.

Eng. S. 0 1 6 8 11 13 16 17 20 22 32 34—36 38 40. Wales 45 49—52. Eng. N. 54 56—58 61—67 69 71. Scot. 85 89 90 107 109 112. No records for Ireland.

Z. glaber (Stud.). Eighteen counties.

Eng. S. 1 16 19 20 22 32. Wales 44 49 50 52. Eng. N. 56—58 60 63—66. No records for Scotland or Ireland.

Ghiessbach; Neuhausen.

Z. nitidulus (Drap.). Fifty-four counties.

Eng. S. 0 1 6 8 9 11—13 15—18 20—24 29 32—35 37—40. Wales 41 43—45 48—52. Eng. N. 56—58 60—67 69. Scot. 73 85 89 90 102 104 109. No records for Ireland.

Weggis, Switzerland.

Z. purus (Ald.). Thirty counties.

Eng. S. 1 8 16 17 19 20 22 29 32 34 35 38 39. Wales 48 49 52. Eng. N. 56—58 62—65 67 69. Scot. 73 89 90 107 109. No records for Ireland.

Z. radiatulus (Ald.). Twenty-three counties.

Eng. S. 6 13 14 17 21 32 34 35. Wales 48 49

52. Eng. N. 56—58 62—67 70. Scot. 89 109. No records for Ireland.

Westbrook, Maine; Muscatine, Iowa, Brandon, and Carberry, Manitoba.

Z. nitidus (Müll.). Eighteen counties.

Eng. S. 6 11 13 16 17 20—22 34 35 37. Wales 51. Eng. N. 54 56—58 63 64. No records for Scotland or Ireland.

Mohawk, N.Y.

Z. excavatus (Müll.). Fifteen counties.

Eng. S. 1 3 11 13 20 23. Wales 45 48. Eng. N. 57 59 63 64 66. Scotl. 100. Irel. 124.

Z. crystallinus (Müll.). Thirty-eight counties.

Eng. S. 3 6 11—13 16 17 19—22 32—34 39. Wales 41 48—52. Eng. N. 54 56—58 60—67 69. Scotl. 73 90 107 109. No records for Ireland.

Frankfort; rejectamenta of Swiss R. Aar; Acireale, Sicily; Malta; Palermo.

Z. fulvus (Müll.). Thirty-one counties.

Eng. S. 11—13 17 20 22 32 37 39 40. Wales 41 45 48 49 51 52. Eng. N. 56 57 61—66 69 70. Scotl. 89 90 107 109. Irel. 119.

Bordeaux; rejectamenta of the Swiss R. Aar; Westbrook, Maine; Carberry and Pine Creek, Manitoba.

Helix lamellata Jeff. Nine counties.

Eng. N. 57 62—64 66 67. Scotl. 72 98 107. No records for Wales, Ireland, or England South.

H. aculeata Müll. Twenty-five counties.

Eng. S. 9 11 14 16 17 20 22 23 32 33 38. Wales 48 52. Eng. N. 56 57 63—66 69. Scotl. 75 89 90 107 109. No records for Ireland.

H. pomatia L. Seven counties.

Eng. S. 12 13 15—17 30 33. No records for Wales, England N., Scotland, or Ireland.

Basle, Frutigen, Kaltbad, Neuhausen, Zurich, Altorf, Fluellen, Brunig Pass, Interlachen, Konigswinter-am-Rhine.

H. aspersa Müll. Sixty-three counties.

Eng. 0—6 8—21 23 24 29 31 32 34—37 39 40. Wales 41 44 45 48—52. Eng. N. 53—58 60—67 69—71. Scotl. 73 82 83 85 89 90 94. No records for Ireland.

Granada; Arcachon; Bordeaux; Fontainebleau; Rouen; Malta; Acireale, Sicily; Dalmatia; Algiers and Constantine; Cape Town; Mauritius.

H. nemoralis L. Seventy-three counties.

Eng. S. 0—6 8—16 18—24 29—40. Wales 41 44 45 48—52. Eng. N. 53—58 60—69 71. Scotl. 73 75 81—83 85 88 90 103. Irel. 115 119 124 125.

Geneva; Ouchy; Basle; Altorf; Lausanne; Drachenfels; Rotterdam; Arcachon; Bordeaux; Viareggio; San Sebastian; Corunna; Carnagore; Paris; Ehrenbreitstein.

H. hortensis Müll. Fifty-nine counties.

Eng. S. 1—6 8—21 23 29 31—40. Wales 41 43 44 45. Eng. N. 55—57 61—67 69 70. Scotl. 73 75 81 82 88—90 107—109. Irel. 125.

Carlsbad; Frankfort; Frutigen; Bordeaux; Fontainebleau.

H. arbustorum L. Forty-eight counties.

Eng. S. 6 7 10 11 13—17 20—23 31—37 39. Wales 41 43—45 49 50. Eng. N. 53 54 56—59 61—67 69. Scotl. 72 77 90 91 107—109. No records for Ireland.

Jaman; Axenstrasse; Frutigen; Brenner Pass; St. Moritz; Chamouni; Grindelwald; Gemmi Pass; Campiodon (*H. Xatartii*); Transylvania; Buda-Pesth; Moravia; Salzburg; Munich; Mittenwald; Norway.

H. Cantiana Mont. Thirty counties.

Eng. S. 5 6 10—20 22 23 29 30 32 36—38.

Wales 41. Eng. N. 54 61—67. No records for Scotland or Ireland.

H. Carthusiana Müll. Two counties.

Eng. S. 14 15.

Bordeaux; Rouen; Rimini; Rome.

H. rufescens Penn. Forty-five counties.

Eng. S. 1 2 4—17 19—24 29 30 32—35. Wales 41 44 45 49—52. Eng. N. 54 58 60—65 69 70. No records for Scotland or Ireland.

Lucerne; Bordeaux.

H. concinna Jeff. Thirty-nine counties.

Eng. S. 0 1 6 8 11 14—17 20—24 31—34 37—39 Wales 41 45 48—50 52. Eng. N. 53 56—58 60 62 64 65 67. Scotl. 73 77 89. No records for Ireland.

Bordeaux.

H. hispida L. Fifty-one counties.

Eng. S. 0 6 8 9 11 13—18 20—24 29—36 39 40. Wales 41 48—52. Eng. N. 53—58 60—67 69 71. Scotl. 73 89 90. No records for Ireland.

Bordeaux.

H. sericea Müll. Twenty-four counties.

Eng. S. 1—3 11 15 20 21 29 32—34. Wales 44 45 49—52. Eng. N. 56 64—67 69. Scotl. 90. No records for Ireland.

H. revelata Mich. Four counties.

Eng. S. 0—3. No records for Scotland, Wales, Ireland, or England North.

Bordeaux.

H. fusca Mont. Fourteen counties.

Eng. S. 3 13 34. Wales 48 49. Eng. N. 57 63 64 66 67. Scotl. 73 80 107. Irel. 114.

H. pisana Müll. Four counties.

Eng. S. 0 1. Wales 45. Irel. 123. No records for Scotland or North of England.

Toledo; Utrera; Gibraltar; Marseilles; Bordeaux;

Mentone; Malta; Golita, near Tunis; Algiers; Tangier; Sicily.

H. virgata Da Costa. Forty-six counties.

Eng. S. 0—6 9—11 13—23 31—34 37. Wales 41 44 45 48—52. Eng. N. 53—57 61—64 66. Irel. 124 139. No records for Scotland.

Tarragona; Bordeaux; La Falaise, near Boulogne; Gibraltar; Palermo.

H. caperata Mont. Fifty counties.

Eng. S. 0 4 6 9—23 32—34 37 38 40. Wales 41 44 45 48—52. Eng. N. 54—58 61—67 71. Scotl. 75 83 85 90 100. No records for Ireland.

Ostend; Jaffa; Bordeaux.

H. ericetorum Müll. Forty counties.

Eng. S. 1 6 12—16 19 20 22 23 30 32—34 39 40 Wales 44 45 50 52. Eng. N. 54—57 61—67 71. Scotl. 107 108 110. Irel. 119 124 127 131.

Bordeaux; Rouen; Axenstrasse; rejectamenta of Aar; Dalmatia.

H. rotundata Müll. Fifty-four counties.

Eng. S. 1 6 8 9 11 13—17 20—23 32—37 39. Wales 41 43 45 48—52. Eng. N. 54—59 61—67 69—71. Scotl. 73 83 85 88—90 107—109. No records for Ireland.

Bordeaux; Weggis and Altdorf (Switz.).

H. rupestris Dp. Twenty-nine counties.

Eng. S. 0 3 6 9 11 13—15 20 22 23 32—34 39. Wales 41 49 50 52. Eng. N. 57 60 62 64—66 69—71. Scotl. 89. No records for Ireland.

Bordeaux; Kandersteg.

H. pygmæa Dp. Sixteen counties.

Eng. S. 17 23 32 33. Wales 50. Eng. N. 56 61 64—67 71. Scotl. 89 107—109. No records for Irel.

H. pulchella Müll. Thirty-four counties.

Eng. S. 1 6 11 13 14 16 19 22 23 29 32—35 39.

Wales 49—52. Eng. N. 54 56 57 61—66 69. Scotl. 83 85 89 90 107. No records for Ireland.

Rejectamenta of Aar; Bordeaux.

H. lapicida L. Thirty counties.

Eng. S. 4 6 9 11—13 15—19 22—24 30 32—35 37 39. Wales 41 43. Eng. N. 56 57 61—65. No records for Scotland or North of England.

Rejectamenta of Aar; Clarens (Switz.); Bordeaux; Carlsbad; Kissingen.

H. obvoluta Müll. Three counties.

Eng. S. 11—13. No records for Wales, Ireland, Scotland, or North of England.

Heidelberg; Vevey; Mentone; Weggis; Neuhausen; rejectamenta of Aar; Ghiessbach.

Bulimus acutus (Müll.). Seventeen counties.

Eng. S. 0 1 4 6 9 10. Wales 41 44 45 50 52. Eng. N. 71. Scotl. 103. Irel. 119 124 127.

Bordeaux; Naples; Malta; Rome; Genoa; Lissa (Dalmatia); Gibraltar; St. Jean de Luz; San Fernando (Spain).

B. montanus Dp. Three counties.

Eng. S. 23 26 33. No records for England North, Wales, Scotland, or Ireland.

Novel (Savoy); Lucerne; Brunig Pass; rejectamenta of Aar.

B. obscurus (Müll.). Thirty-nine counties.

Eng. S. 3 6 9 11—17 19 20 22 23 29 30 32—35 39 40. Wales 41 50 52. Eng. N. 56—58 60—67 69. Scotl. 83 89 90. No records for Ireland.

Rejectamenta of Aar; Madonie, Sicily.

Pupa secale Dp. Eleven counties.

Eng. S. 6 9 13 14 23 33—35. Eng. N. 64 65 69. No records for Wales, Scotland, or Ireland.

Ariége; Weggis (Switz.).

P. ringens Jeff. Six counties.

Eng. S. 0. Eng. N. 61 62 64 66 67. Scotl. 107 108. No records for Wales or Ireland.

P. umbilicata Dp. Fifty counties.

Eng. S. 0 1 3 6 9 11—16 21—23 32—34 37 39 Wales 41 44 45 49—52. Eng. N. 56—58 61—67 69—71. Scotl. 73 75 83 85 89 90 107—109. Irel. 119 139 Patras; Palermo.

P. marginata Drap. Twenty-six counties.

Eng. S. 6 9 11—16 19 23 32—34 37. Wales 49 51. Eng. N. 56—58 61—64 66 67 71. No records for Scotland or Ireland.

Rejectamenta of Aar.

Vertigo antivertigo (Dp.). Ten counties.

Eng. S. 10 22 23 34. Wales 50. Eng. N. 56 64. Scotl. 81 107. Irel. 124.

Palermo.

V. Lilljeborgi Westerl. One county.

Irel. 139. No records for England, Wales, or Scotland.

V. Moulinsiana (Dup.) non Jeff. One county.

Eng. S. 20. No records for England North, Wales, Scotland, or Ireland.

V. tumida Westerl. Not seen.

V. pygmæa (Drap.). Twenty-one counties.

Eng. S. 6 11—15 17 23 27 32—34. Wales 49. Eng. N. 56 57 62—67. Scotl. 83 107 109. No records for Ireland.

V. alpestris Ald. One county.

Eng. N. 69. No records for England South, Wales, Scotland, or Ireland.

V. substriata (Jeff.). Two counties.

Wales 52. Eng. N. 66. No records for England South, Scotland, or Ireland.

V. pusilla Müll. Six counties.

Eng. S. 23. Eng. N. 63 64 66 67. Scotl. 75. No records for Wales or Ireland.

V. angustior Jeff. Four counties.

Scotl. 107. Irel. 136 139 147. No records for England or Wales.

V. edentula (Drap.). Twenty counties.

Eng. S. 11 20 23 32—34. Wales 52. Eng. N. 56 57 63 64 66 69. Scotl. 81 89 90 100 107—109. No records for Ireland.

V. minutissima (Hartm.). Four counties.

Eng. S. 10. Eng. N. 63 66. Scotl. 83. No records for Wales or Ireland.

Rejectamenta of Aar.

Balea perversa (L.). Twenty-four counties.

Eng. S. 3 6 11—14 22 32. Wales 41 45 49 50. Eng. N. 55 58 60 64 65 69—71. Scotl. 73 83 89 109. No records for Ireland.

Madonie, Sicily.

Clausilia rugosa (Drap.). Sixty-nine counties.

Eng. S. 0—3 6 8 9 11—17 19—24 30 32—40. Wales 41 43—45 47—52. Eng. N. 53 55—67 69—71. Scotl. 73 76 83 88—90 103 107—109. Irel. 139 147 148.

French Pyrenees.

C. Rolphii Gray. Seven counties.

Eng. S. 12—14 16 17 22 33. No records for Wales, England North, Scotland, or Ireland.

Havre.

C. biplicata (Mont.). Three counties.

Eng. S. 17 20 21. No records for Wales, England North, Scotland, or Ireland.

Via Mala; Gratz; Salzburg; Schreckenstein, Bohemia; Heidelberg; Brussels.

C. laminata (Mont.). Twenty-six counties.

Eng. S. 6 9 11—17 20 22 23 32—34 39. Wales 41. Eng. N. 56 57 61—67 69. No records for Scotland or Ireland.

Carinthia; Salzburg; Weggis, Switz.

Cochlicopa tridens (Pult.). Fourteen counties.

Eng. S. 6 14 17 23 34 38. Eng. N. 56 57 63—67 69. No records for Wales, Scotland, or Ireland.

C. lubrica (Müll.). Forty-nine counties.

Eng. S. 0 1 6 8 11 13—17 20—23 29 30 32—34 39. Wales 41 43 45 48—52. Eng. N. 56—58 60—67 69 71. Scotl. 73 83 85 89 90 107—109. No records for Ireland.

Rigi; rejectamenta of Aar.

Achatina acicula (Müll.). Nine counties.

Eng. S. 14 15 19 23 34. Eng. N. 56 63 64 67. No records for Wales, Scotland, or Ireland.

Rejectamenta of Aar.

Carychium minimum Müll. Thirty-two counties.

Eng. S. 6 13—17 20—23 32—34 39. Wales 49—52. Eng. N. 56—58 61—67. Scotl. 73 89 90 107. No records for Ireland.

Rejectamenta of Aar.

Cyclostoma elegans (Müll.). Twenty-one counties.

Eng. S. 3 6 9 11—17 20 22 29 30 35 36. Wales 41 45 50. Eng. N. 62 64 69. No records for Scotland or Ireland.

Balearic Isles; Bordeaux; Rimini; Calatabiano, Sicily.

Acme lineata (Drap.). Five counties.

Eng. S. 15 23. Eng. N. 63 64 66. No records for Scotland or Ireland.

Sphærium corneum (L.). Forty counties.

Eng. S. 6 11 14—17 20—24 30 32—34 37 39 40. Eng. N. 53—67 69. Scotl. 73 76 81 88 89 112. No records for Wales or Ireland.

S. rivicola (Leach). Thirteen counties.

Eng. S. 6 21—23 32—34. Eng. N. 53 56 58 62—64 67. No records for Wales, Scotland, or Ireland.

S. ovale (Fér.). Four counties.

Eng. S. 17 21. Eng. N. 62 63. No records for Wales, Scotland, or Ireland.

S. lacustre (Müll.). Twenty-one counties.

Eng. S. 3 6 11 12 15—17 21 32 34 38. Wales 44 49 50. Eng. N. 56 61—64 66 67. No records for Scotland or Ireland.

Palermo.

Pisidium amnicum (Müll.). Seventeen counties.

Eng. S. 11 13 22—24 29 38. Eng. N. 53 55 56 58 60 61 63—65 67. No records for Wales, Scotland, or Ireland.

P. fontinale (Drap.). Thirty-two counties.

Eng. S. 0 1 6 9—11 13 17 21 32—34 38. Wales 44 45. Eng. N. 53 56 58—67 69. Scotl. 73 90 108. Irel. 124.

P. pusillum (Gmel.). Twenty-nine counties.

Eng. S. 0 6 9 11 13 14 16 17 21 23 26 32 33. Wales 41 42 45. Eng. N. 56 61—64 66 67 70. Scotl. 73 81 90 107 108. No records for Ireland.

P. nitidum Jen. Fourteen counties.

Eng. S. 6 10 16 23 38. Eng. N. 56 57 61 63—65 67. Scotl. 94 112. No records for Wales or Ireland.

P. roseum Scholtz. Three counties.

Eng. S. 20 30. Eng. N. 56. No records for Wales, Scotland, or Ireland.

Unio tumidus Phil. Twelve counties.

Eng. S. 21—23 32 34. Eng. N. 53 55—57 61 63 64. No records for Wales, Scotland, or Ireland.

U. pictorum (L.). Thirteen counties.

Eng. S. 6 17 21 22 29 32 38. Eng. N. 53 56 57 62—64. No records for Wales, Scotland, or Ireland.

U. margaritifer (L.). Ten counties.

Wales 45 49 50. Eng. N. 62 67 71. Scotl. 90 107. Irel. 126 145. No records for England South.

Anodonta cygnea (L.). Twenty-one counties.

Eng. S. 20 22—24 30 32 33 38. Wales 42 45. Eng. N. 53 55 56 58 59 61—64 67. Scotl. 90. No records for Ireland.

A. anatina (L.). Thirteen counties.

Eng. S. 15 16 21 22 32. Wales 45. Eng. N. 56 61—65 67. No records for Scotland or Ireland.

Dreissena polymorpha (Pall.). Twelve counties.

Eng. S. 17 21—23 29 31 32 40. Eng. N. 56 58 63 64. No records for Wales, Scotland, or Ireland.

Neritina fluviatilis (L.). Eighteen counties.

Eng. S. 6 11 13 14 16 21—24 29 32. Eng. N. 53 56 57 60 62 64 65. No records for Wales, Scotland, or Ireland.

Palermo; Algiers.

Paludina contecta (Millet). Fifteen counties.

Eng. S. 11 22—24 27 29 31 32. Eng. N. 53 54 58 59 61 63 64. No records for Wales, Scotland, or Ireland.

P. vivipara (L.). Seventeen counties.

Eng. S. 17 20—23 31—34 38. Eng. N. 53 55—57 62—64. No records for Wales, Scotland, or Ireland.

Bythinia tentaculata (L.). Thirty-five counties.

Eng. S. 5 6 10 11 15—17 20—24 29 30 32—34 38 39. Wales 41. Eng. N. 53—58 60—67. Scotl. 76. No records for Ireland.

Bordeaux; Cologne; China.

B. Leachii (Shepp.). Seventeen counties.

Eng. S. 6 11 14—16 21 23 32—34. Eng. N. 53 56 57 60—64. No records for Wales, Scotland, or Ireland.

Bordeaux; Sarno R., Sicily.

Valvata piscinalis (Müll.). Thirty counties.

Eng. S. 6 11 15—17 19 20 23 24 27 32—34 40. Wales 41 45. Eng. N. 53 54 56 57 60 61 63—67 71. Scotl. 73 89. No records for Ireland.

V. cristata Müll. Nineteen counties.

Eng. S. 11 14—17 22 23 27 32. Wales 41 42 45. Eng. N. 56 61 63 64 66 67. Scotl. 73. No records for Ireland.

Planorbis lineatus Walk. Seven counties.

Eng. S. 14—17 27. Eng. N. 61 64. No records for Wales, Scotland, or Ireland.

Bavaria; Frankfurt; Saxony.

P. nitidus (Müll.). Fourteen counties.

Eng. S. 6 13 16 17 19 37 38. Eng. N. 53 56 61—64 67. No records for Wales, Scotland, or Ireland.

P. nautileus (L.). Twenty-two counties.

Eng. S. 6 9 16 19 23 32 37 38. Wales 41. Eng. N. 53 56—60 62—65 67. Scotl. 73 90. No records for Ireland.

Bordeaux.

P. albus (Müll.). Thirty-three counties.

Eng. S. 3 11 13 15—17 21—23 32—35 37—40. Wales 41 45 52. Eng. N. 53—56 59 60 62—65 67 71. Scotl. 73. No records for Ireland.

Bavaria; Neumark, Prussia; R. Rouge, Michigan; Bordeaux.

P. parvus Say. Thirteen counties.

Eng. S. 3 6 9 17 38. Eng. N. 56 57 63 65—68. Scotl. 108. No records for Wales or Ireland.

Grand Rapids, Michig.; Birtle, Rapid City, Beaver Creek, and Pine Greek, Manitoba.

P. dilatatus Gld. One county.

Eng. N. 59. No records for Wales, Scotland, or Ireland.

Westbrook, Me.

P. spirorbis Müll. Thirty-one counties.

Eng. S. 0 1 6 11 13 16 18 21—23 29 32 33 37 38. Wales 42 45 52. Eng. N. 53 56 57 61—64 66 67. Scotl. 73 89 90 108. No records for Ireland.

Frankfurt; Bordeaux.

P. vortex (L.). Thirty-two counties.

Eng. S. 0 6 11 13 15—17 19—24 32—34 37—40. Wales 41. Eng. N. 53—58 61—64. Irel. 131. No records for Scotland.

Bordeaux; Obedeska Bara, Slavonia.

P. carinatus Müll. Thirty counties.

Eng. S. 6 11 15 17 19—24 29 32—34 37—39. Wales 41. Eng. N. 53 54 56—58 61—66. Irel. 131. No records for Scotland.

Bordeaux.

P. complanatus (L.). Thirty-seven counties.

Eng. S. 5 6 11 13—17 19—24 29 30 32 34 38 39. Wales 41 42. Eng. N. 53 55—57 59—67. Scotl. 83. Irel. 131.

Holland; Neumark, Prussia; Bordeaux; Obedeska Bara, Slavonia; Algiers.

P. corneus (L.). Thirty-one counties.

Eng. S. 6 11 13 15—17 20—24 27 29—34 37—39. Eng. N. 53 55—58 61—65. No records for Wales, Scotland, or Ireland.

Bordeaux; Holland; Wurtemburg; Hungary; Neumark, Prussia; Broussa; Aschersleben; Brunswick; Obedeska Bara, Slavonia.

P. contortus (L.). Twenty-nine counties.

Eng. S. 6 11 13 15—17 19—23 29 32 33 37—39. Eng. N. 53—56 61—64 66. Scotl. 73 89 90. No records for Wales or Ireland.

Bordeaux.

Physa hypnorum (L.). Twenty-two counties.

Eng. S. 0 6 16 19 34 37 38 40. Wales 41 42 45 50.

Eng. N. 56 58 61—67. Scotl. 81. No records for Ireland.

Holland ; Frankfurt ; Michigan ; Illinois ; Utah ; Carberry, Brandon, Fort Ellice, Birtle, &c., Manitoba.

P. fontinalis (L.). Thirty-one counties.

Eng. S. 6 11 15 17 20—23 32 33 37—39. Wales 41 42. Eng. N. 53—59 61—64 66 67 71. Scotl. 73 89. No records for Ireland.

Neumark, Prussia ; Holland.

Limnæa glutinosa (Müll.). Six counties.

Eng. S. 15 22 27. Eng. N. 62. Irel. 115 131. No records for Wales or Scotland.

South Sweden.

L. involuta Thomps. One county.

Confined to county Kerry (No. 148).

L. peregra (Müll.). Sixty-eight counties.

Eng. S. 0 1 5 6 10—17 19—24 29 30 32—34 37—40. Wales 41 42 44 45 49 50 52. Eng. N. 53—71. Scotl. 72 73 75 81 85 88—90 98 100 103 107 112. Irel. 114 148.

Bordeaux ; St. Malo ; Marseilles ; Jura ; Holland ; Carinthia ; Rovereto ; Iceland ; Obedeska Bara, Slavonia ; Gibraltar ; China ; Oreto R. and Madonie, Sicily.

L. auricularia (L.). Twenty-nine counties.

Eng. S. 6 11 13 15 16 21—24 27 30 32—34 37—39. Wales 44. Eng. N. 53 56 57 59 61—64 66 67. Scotl. 83. No records for Ireland.

Holland ; Frankfurt ; Neumark, Prussia.

L. stagnalis (L.). Thirty-three counties.

Eng. S. 5 6 11 13 15 16 20—24 29 30 32—34 37—40. Eng. N. 54—59 61—67. No records for Wales, Scotland, or Ireland.

Holland ; Lake Michigan ; Wisconsin ; Lake Superior ; Bordeaux ; Birtle, Rapid City, Carberry, Cook's Lake and near Shoal Lake, Manitoba ; Obedeska Bara, Slavonia.

L. palustris (Müll.). Forty-four counties.

Eng. S. o 6 11—17 19—23 27 29 32—34 37—39. Wales 41 42 45. Eng. N. 54 56—58 60—67 69 70. Scotl. 73 88 89. Irel. 145 148.

Wisconsin; Detroit River; Springwells, Houghton Lake, and Ann Arbor, Mich.; Rhode Island; Ratzeburg Lake, Germany; Holland; Begles, near Bordeaux; Bordeaux; Buda-Pesth; Obedeska Bara, Slavonia; Carberry, &c., Manitoba; Madonie, Sicily.

L. truncatula (Müll.). Forty-five counties.

Eng. S. 6 9 11 13 15—17 19 21—23 32—34 37—39. Wales 41 44 45 49 50. Eng. N. 55—59 61—67 70 71. Scotl. 75 85 89 90 100 107—109. Irel. 139.

Funchal, Madeira; Harz; Bordeaux; Palermo; Algiers.

L. glabra (Müll.). Sixteen counties.

Eng. S. o 16 19 37 39 40. Eng. N. 59 61—67 69 70. No records for Wales, Scotland, or Ireland.

Neumark, Prussia; Begles, near Bordeaux; Bordeaux.

Ancylus fluviatilis Müll. Thirty-seven counties.

Eng. S. 1 6 9 11 13 15 17 19 20 23 32 34 35 37—40. Wales 41 44 47 52. Eng. N. 56—58 61—65 67 69—71. Scotl. 73 75 89 108. No records for Ireland.

Neumark, Prussia; Bordeaux; Alcantara R., Sicily.

A. lacustris (L.). Twenty-one counties.

Eng. S. 6 11 16 22 23 32—34 37—39. Wales 41. Eng. N. 56 58 61 63—67. Scotl. 73. No records for Ireland.

It will be seen on perusal of the above census that the principal places to be regarded as among the uninvestigated and 'dark corners' of the kingdom are Scotland and Ireland, Mid-Wales, and the eastern and south-western counties of England. Specimens from any of which districts will be of unusual value and importance.

ADDITIONAL CAPTURES FROM PRESTON CANDOVER, N. HANTS,

By H. PUREFOY FITZGERALD, M.C.S.

Since my list of mollusca from this valley was published (vide No. 7, vol. iv, J.C.), I have made several additional captures. I have submitted them all for examination to Mr. J. W. Taylor, who has pronounced them to be as follows, the numbers being continued from the last list:—

62. **Sphærium lacustre** (Müll.). Frequent.

63. **Planorbis vortex** (L.). Frequent.

64. **Limnæa peregra** var. **ovata** Drap. Scarce.

65. Do. var. **ovata,** monst. **decollatum.** Very scarce.

66. **Ancylus fluviatilis** var. **albida** Jeff.—This variety seems to be frequent in the south of Hants, as Mr. C. Ashford informs me that it occurs at Christchurch, and with the albine variety of *A. lacustris* (which I have not yet found, though no doubt it will soon turn up). It extends all along the coast into mid-Sussex.

67. **Helix hispida** L. Scarce.

68. **H. caperata** var. **ornata** Picard. Frequent.

69. **H. lapicida** var. **albina** Menke.—This very scarce variety I found living with the type, but only two specimens.

70. **Pupa marginata** var. **edentula** Moq. Very scarce.

71. **Clausilia laminata** var. **albinos** Moq.—Has turned up in considerable quantities in one copse. I have also found several young specimens, which would seem to prove that the variety is hereditary.

Anodon herculeus Gerstford (?).—Having lately read in 'Science Gossip' (244) Mr. Tye's interesting record of large *A. cygneus* (of which Mr. Sclater 'crowns all' with one measuring 8¼ in. and one 9 in. in width from R. Dart), I considered myself fortunate in finding in a souvenir-shop at Arca-

chon, Gironde, a box of valves of a large Anodon, which the lady in charge (knowing the value of accurate localization), positively assured me came from the R. Adour which flows by Dax, of even larger sizes. The largest measures 10·6 × 6 × 3·8 in. another valve 10·0 × 5·8 in.; and 9·5 × 5·5 in. are common dimensions amongst the smaller shells. I had no books with me, and at first thought I had found gigantic *cygneus*. It was not however given to me to beat Mr. Sclater this time. A friend helped me to a trustworthy opinion, from Bordeaux (where there is in the museum a very interesting collection of French land and freshwater and Bay of Biscay shells), which positively declared that these shells were not from the Adour. They appear to belong to *A. herculeus*, sp. 7 of Mr. L. Reeve's Monograph of 1867. His description (from one valve in Mr. Cuming's collection, now exhibited in the British Museum as from Japan), is curiously generic rather than specific. The margin '*ad terminum subalatus et subangulatus*,' and the plicated umbos are however characteristic, the former features more or less markedly in different specimens. The plication is peculiar. The young shell had a strongly-marked angular ridge from the umbo towards the posterior end of the shell, and, on each side of this, very distinct corrugations parallel to the ventral and superior posterior margins. The umbonal region in all my shells is much eroded, but in some of the least wasted there appears, from a point about an inch behind the actual umbo, a series of strong waves (more prominent in those shells whose alae are best developed) which cross the lines of growth, i.e., passing from the ridge to the posterior dorsal margin backwards show a series of long pits rather than mere wavy depressions. This configuration is even more distinctly visible inside, and, in a characteristic shell with a well-grown wing and twelve or fourteen iridescent undulations crossing the lines of growth, is extremely 'effective.' I only just escaped shipwreck by mistaking the lights, but I believe the identification is now correct. Forsan et haec olim meminisse juvabit.—R. D. DARBISHIRE.

NOTES ON THE LAND & FRESHWATER MOLLUSCA OF MANITOBA.

By ROBERT MILLER CHRISTY.

Although Manitoba is a country which has of late occasioned much talk and discussion, it is but comparatively a few years since it was the undisputed home of the Indian, the Buffalo, and the Hudson's Bay Company. What little was then known as to its great agricultural capabilities and its natural products had principally been collected by survey-parties sent out for the purpose of selecting the best route across the continent for the Canadian Pacific Railway, consequently it is but slight wonder that very little should be known concerning so comparatively unimportant a branch of natural history as the mollusca.

Having found occasion to visit Manitoba several times during the last two years, and having always endeavoured to obtain as large a series as possible of its mollusca, it is now my intention to make a few remarks upon the results of my collecting; and in so doing it is impossible for me to acknowledge too fully my great indebtedness to Mr. J. W. Taylor who has been most kind in identifying all my specimens. So little having hitherto been published upon the subject, I have thought it well to make my notes as complete as possible by incorporating with them some additional information gained from two other sources. One of these is a collection of the shells of Manitoba and the region around the Lake of the Woods formed by Dr. G. M. Dawson of the Geological Survey of Canada, and now exhibited in the Peter Redpath Museum at Montreal; the other source consists of two lists of shells collected in the country between Winnipeg and York Factory, by Dr. Robert Bell, also of the Survey, identified by Mr. J. F. Whiteaves, and published in the Annual Reports.*

* App. III. (pp. 61 and 62) to Mr. Bell's Report of 1878—79; also App. IV. (pp. 75 and 76) to Mr. Bell's Report of 1879—80.

The contributions of these gentlemen are indicated by having their respective names attached.

Those who entertain the usual English idea that the Manitoban winter is an altogether unbearable one, of purely Arctic inclemency, may at first be surprised to learn that the country possesses a molluscan fauna at all; still more that I am able to enumerate 72 species. Nor is this idea altogether unreasonable, for it certainly is somewhat surprising that so many species should be able to exist in a country where the temperature has been known to be as low as $-50{\cdot}5^{\circ}$ Fahr. At the same time it should be remembered that the Manitoban summer is a delightful time.

The one great fact which must strike all observers of the molluscan fauna of Manitoba is the absence from the bare, open face of the prairies of every single species of land mollusk whatsoever. This absence, so far as my experience goes, is total and complete. On the other hand, the abundance of aquatic species is extraordinary. Nearly every one of the innumerable lakes and lakelets, so abundantly scattered over the prairies, contains a surprising number of shells belonging to several species. When the water has disappeared after a period of drought, they may often be scraped up by the handful at a time. Prof. Hind, in his "Narrative of the Assiniboine, Red River, and Saskatchewan Exploring Expeditions of 1857—58," * says of the southern end of Lake Winnipeg: "The beach and marshes contain an infinite number of freshwater shells, belonging to the genera *Helix*, *Bulimus*, *Succinea*, *Pupa*, *Planorbis*, *Limnæus*, &c. For many hundred yards the beach is covered with perfect or disintegrated forms of these shells thrown up by the waves on the sand." This statement serves well to show the enormous abundance of shells in, the Manitoban lakes; but as only two of the genera mentioned inhabit the water, one cannot help thinking that their identification must be wrong.

* Vol. II., p. 8.

Of the 72 species which I am able to record, only 16 inhabit the land, and even they are only found in moist situations where the fire seldom penetrates. This great dearth of terrestrial species might, on first thoughts, very naturally be attributed to the excessive frosts, but I believe I am able to assign to it a much more direct cause, viz., Fire. If it were attributable to cold, how is it that thousands of individuals are able to exist in shallow ponds that must certainly become frozen solid during winter? I have elsewhere entered fully into the subject of the effect produced on the face of the country by the extensive prairie-fires that have annually swept over it for generations past.* There are good reasons for believing that the very prairies themselves, their treelessness, and their fertiliy are all due, to a large extent, if not entirely, to the action of these fires. I have further stated my belief† that the complete absence of earth-worms of every kind from the surface of the prairies is, in all probability, due to the same cause; and I see no reason to suppose that the remarkable absence of land shells is due to any other. The fire annually burns the grass over which it passes, completely down to the ground, and I have had many occasions of observing that this would effectually kill any mollusks that were harbouring among its roots. On the drier portions of the prairies, settlers often cut their hay round the margins of small depressions in which water collects, and shells —especially Limnæidæ—live during the spring. This done, they set fire to the remaining grass-stalks in order, as they say, that the grass may come up greener and more succulent the following spring. Under such conditions I have often seen the shells lying on the dry pond-bottom completely scorched and calcined by the flames. It seems to me, therefore, in every way probable that these prairie fires are the cause of this absence of terrestrial mollusks from the face of the country, especially

* 'Manitoba Described,' p. 20. Wyman & Sons, Great Queen Street, W.C. 1885.

† 'Nature,' Jan. 3, 1884, p. 213.

as aquatic species, in astonishing abundance, are found in all the ponds, lakes, sleughs, and streams.

Most of my collecting was done in the vicinity of the town of Carberry, which is surrounded by a dry, level prairie, known as the Big Plain. Others of my specimens I obtained from the many moist spots or ponds occupying the hollows of the rolling prairie around the City of Brandon; others from the innumerable ponds and lakes everywhere dotting the country between Brandon and Fort Ellice; others from depressions in the level sandy prairie south of Beaver Creek, near Fort Ellice; while others are from the Red River, the Souris, and the Assiniboine. One great feature of the prairie-region, of which Manitoba forms part, is the extraordinary number of lakes and lakelets. Their number is enormous, especially in some localities. They are of all sizes from the dimensions of one's sitting-room up to the size of Lake Winnipeg; but the most common size is from one-quarter to half-an-acre. The smaller ones dry up completely during the summer and autumn; while the water in the larger ones becomes greatly lowered, to be raised again by the melting of the snow in the spring. Myriads of mollusks must come into existence every spring, only to be killed by the drying up of the ponds later in the year. To such an extent is this the case that one is almost led to wonder that their extermination does not ensue. When crossing, last October, the wide stretch of level sandy prairie south of Beaver Creek, I was surprised to find the ground strewn for long distances—often a mile or a mile and a half—with bleaching fresh-water shells, showing clearly the extent of the waters in the spring-time, though I saw but few pools. *Limnæa palustris* was the commonest species under these conditions; but, in the deeper depressions, where rushes grew, there were others, including *Bulinus hypnorum*, *Sphærium jayanum*, *Planorbis exacutus*, &c. A sleugh is a marshy spot or pool on the surface of the prairie, often occupying the bottom of a coulée or old watercourse. "The Swamp," more than once referred to, is a large extent of almost impassable virgin swamp,

covering several square miles in area, and lying among the sand-hills about eight miles south of Carberry. In most places it is covered with a dense growth of spruces and tamaracs, under the shade of which the Indian Pitcher plant *(Sarracenia purpurea)* often covers acres of the sodden, mossy ground, which quakes as one walks over its treacherous surface. The giant Lady's Slipper *(Cypripedium purpureum)*, several of the Sundews *(Droseræ)*, and many other interesting plants inhabit the same locality. There are, in Manitoba, several Pine Creeks, but the one so often referred to is a rather small river which flows through the heart of the great swamp just referred to, winding its way dreamily to the Assiniboine through many muddy channels, clogged by the leaves of the water-lily, and fringed with a thick growth of willows and bulrushes. I never felt so utterly beyond the range of civilization as when a friend and myself found ourselves (in the course of our travels) miles from any other human beings, on the edge of this lonely, but beautiful, stream, across which we found it necessary to swim, carrying all our effects. Looking down from the shaking bank into the clear, dark water (which I afterwards learned, from personal experience, was highly poisonous), I could see many little collections of dead shells lying at the bottom. Placing a stick in the spout of our camp-kettle, I made a dive, and a single scoop with this primitive dredge brought up more than a dozen different species. That some, at least, of the rivers abound with shells, is shown by the fact that several in the North-west Territories have received the distinctive name of "Shell River." I have seen the bed and sides of the principal of these, which runs into the Assiniboine from the east about fifty miles above its junction with the Qu'appelle, strewn with hundreds of dead shells belonging to many different species of Unionidæ; but, as I had no means of bringing any away, they are not again referred to herein.

Unio rectus Lam.—Red River at Winnipeg. Do. (Bell).

U. radiata Lam.—Numerous in Lake Winnipeg and the Nelson River (Bell).

U. luteolus Lam. (=*Hyridella luteola* Lam. =*U. siliquoides* Barnes).—Common in the Red River at Winnipeg, and in the Assiniboine at Brandon. Red River (Bell).

U. rubiginosus Lea (=*Lampsilis flavus* Rafinesque).—Junction of Souris and Assiniboine. Red River (Bell).

U. plicatus Le Sueur.—Red River at Winnipeg. (Do. Bell).

U. asperimus Lea. Do. do.

U. undulatus Barnes. Do. do.

U. ———— ? Do. do.

U. ———— ? Do. do. Assiniboine at Brandon.

U. ———— ? Assiniboine at Brandon.

U. ———— ? Do. do.

U. ———— ? Red River at Winnipeg.

U. lachrymosus Lea (=*Theliderma quadrulus* Raf.).—Red River, Manitoba (Bell).

U. multiplicatus Lea.—Red River. Common (Wm. Brodie, Esq., of Toronto).

U. borealis Gray.—Near the Lake of the Woods (W. Brodie, Esq.).

Metaptera alatus Say. Do. do.

Complanaria complanata Barnes.—"Common in the Nelson River, but larger in the Red and Assiboine Rivers" (Bell).

Strophitus pennsylvanicus Lam. (=*Anodonta undulata* Say).—Lake Winnipeg, Great Play Green Lake (Bell).

Anodonta ? sp.—Red River at Winnipeg (Bell).

Pisidium variabile Prime.—Common in Pine Creek.

Sphærium sulcatum Lam.—Stony Creek, near Fort Pelly, a tributary of the Assiniboine; Pine Creek. Probably common in creeks.

S. rhomboideum Say.—Common in Pine Creek.

S. striatinum Say.—Several from Pine Creek. Ponds at York Factory; also in abundance in the stomach of a sturgeon caught in the Great Play Green Lake (Bell).

S. transversum Say.—Numbers in the stomach of the same sturgeon. (Bell).

S. jayanum ? Prime.—Abundant among roots of rushes on wetter parts of the shell-covered prairie south of Fort Ellice, but not observed elsewhere.

S. solidulum Prime.—Bleached and semi-fossil specimens were abundant in the denuded banks of the Red River at Winnipeg and the Assiniboine at Brandon.

Vitrina limpida Gould.—Among moss beside a sleugh near Carberry, but not seen elsewhere. Near Reed River; the Lake of the Woods (Dawson). In damp Woods at Norway House (Bell).

Hyalina arborea Say.—Moist spot beside sleugh near Carberry; under chips and pieces of wood in the Swamp. Round Lake of the Woods (Dawson).

H. viridula Menke (=*Zonites radiatulus* Ald.).—Dry pond-hole on prairie near Brandon; common among roots of grass beside sleugh near Carberry. Lake of the Woods; Pembina Mountain (Dawson).

H. indentata Say.—One specimen of the variety with open umbilicus from Pine Creek.

H. fulva Drap.—Pretty common in moist spots beside sleughs near Carberry; also in the Swamp; Pine Creek. Lake of the Woods; Pembina Mountain (Dawson).

Helix striatella Anth.—Beneath chips and pieces of wood and among moss in the Swamp. Turtle Mountain; Lake of the Woods (Dawson). "In Woods round the Lakes of the Winnipeg Basin" (Bell).

H. labyrinthica Say.—Edge of sleugh near Carberry; and in the Swamp.

H. pulchella Müll.—Pembina Mountain (Dawson).

Cionella sub-cylindrica Linn. (= *Cochlicopa lubrica* Müll.)—Among moss and grass-roots in moist spots beside sleughs near Carberry, but not common. Turtle Mountain; Lake of the Woods (Dawson).

Pupa contracta Say.—One specimen (the only representative of the genus seen) from among grass-roots beside a sleugh near Carberry.

Succinea haydeni Binney.—Pembina Mountain (Dawson).

S. ovalis Gould.—Lake at High-bluff; quite common on wet moss and weeds beside lakes and sleughs near Carberry and Brandon. Lake of the Woods (Dawson). "From Norway House to York Factory; very numerous at the latter place among grass on damp ground which is occasionally covered with fresh-water at high tide" (Bell).

S. avara Say.—Edge of a lake at High-bluff; many bleached specimens were strewn over the dry alkaline surface of a large shallow pond-hole at Two Creeks, about twenty miles north of Virden. Lake of the Woods (Dawson).

S. obliqua Say.—Lake of the Woods; Dufferin (Dawson).

S. hawkinsii Baird (=*S. elegans* Risso.)—Fairly common on edges of lakes round Carberry, Birtle, &c.

Carychium exiguum Say.—Edge of sleughs near Carberry; Pine Creek; dry pond-hole near Brandon. Apparently well distributed.

Limnæa stagnalis Linn.—Very common, though it does not appear in all lakes. The specimens are sometimes very fine, and, as a rule, all those in any one lake appear to be of about the same size. I have fine specimens from lakes near Birtle, Rapid City, and Carberry; also smaller ones from Cook's Lake, near Shoal Lake, &c. "In nearly all the lakes, streams, and marshes from Manitoba to York Factory" (Bell).

L. megasoma Say.—"This fine species was found living in considerable numbers in the Echimamish River, between the Nelson and the Height of Land. Its discovery at this

place is interesting on account of its great distance to the Northward of previously-known localities for the species." (Bell).

L. palustris Müll. (=*L. elodes* Say).—This is by far the commonest shell in Manitoba. It is abundant in nearly all lakes, ponds, and sleughs all over Manitoba wherever I have been. It is exceedingly variable and possibly includes several allied species, but neither Mr. Taylor nor myself are able to distinguish them. I obtained a semi-scalariform monstrosity from a lake near Carberry. "Numerous and fine in ponds at York Factory; also abundant in ponds along the Red River in Manitoba." (Bell).

L. elodes Say.—Lake of the Woods; Dufferin; Pembina, and Turtle Mountains (Dawson).

L. elodes var. **umbrosa.**—Sleugh near Beaver Creek.

L. elodes var. **——— ?**—A very small form, not exceeding three-eighths of an inch in length. Abundant in a dry sleugh near Brandon.

L. desidosa ? Say.—Dry pond-hole near Brandon.

L. catascopium Say.—Dufferin (Dawson). Great Play Green Lake; common in different parts of Oxford Lake (Bell).

L. caperata Say.—Pine Creek; Lake near Rapid City. Pembina Mountain (Dawson).

L. cygruata Say.—Dufferin (Dawson).

L. decollata Migel.—Lake of the Woods (Dawson).

L. humilis Say.—Dry pond-hole near Brandon. Pembina Mountain (Dawson).

Physa ancillaria Say.—Lake of the Woods (Dawson).

P. heterostropha Say.—Appears to be widely distributed, but is not common. I got fine specimens from Two Creeks and from a lake at High-bluff, while smaller ones came from lakes near Brandon, Birtle, Rapid City, and Carberry. Lake of the Woods (Dawson).

P. gyrina ? Say.—"Small specimens of a Physa resembling the *P. elliptica* of Lea [=*P. gyrina* Say ?], but possibly distinct herefrom, were found in ponds at York Factory" (Bell).

Bulinus hypnorum Linn.—A very common shell in lakes and sleughs. Carberry, Brandon, Fort Ellice, Birtle, &c., &c. Pembina Mountain, &c. (Dawson). "This species occurs in ponds all the way from Manitoba to York Factory" (Bell).

Planorbis trivolvis Say.—A fairly abundant and well distributed species. I found it in most lakes, but not in all, throughout the country. Lake of the Woods; Dufferin, &c. (Dawson). "Some very large specimens of this were collected in the Echimamish River on the west side of the Height of Land. Although common in ponds, rivers, and marshes to the south and west, it was not observed to the northward of this locality" (Bell).

P. bicarinatus Say.—"A peculiar variety of this species occurs in Lake Manitoba"; Lake Winnipeg (Bell).

P. complanatus Say.—"Abundant in Lake Winnipeg and in the Red and Nelson Rivers" (Bell).

P. corpulentus Say.—Lake of the Woods (Dawson).

P. exacutus Say.—Common in many of the lakes and ponds between Birtle and Rapid City, but not in all; ponds near Beaver Creek; Pine Creek. Not seen near Carberry or Brandon.

P. parvus Say.—Exactly the same as the last species.

P. umbilicatus Taylor, n. sp.—Found in ponds betweeu Rapid City and Birtle; also near Brandon.

Segmentina armigera Say.—A few from Pine Creek; common in some lakes and sleughs near Birtle, Fort Ellice, Two Creeks, &c., but not in all; abundant in a lake at High-bluff; not seen near Carberry or Brandon. Several localities in Manitoba (Dawson). "In ponds between Forts Ellice and Pelly; abundant in Great Playgreen Lake" (Bell).

Ancylus parallelus Haldeman.—Pine Creek, one specimen. Rainy River; Lake of the Woods (Dawson).

A. singularis ——— ?—Souris River (Dawson).

Valvata tricarinata Say.—Small, depressed form. Pine Creek, common. Found in the stomach of a sturgeon caught in the Great Play Green Lake (Bell).

V. sincera Say.—Several bleached specimens from Pine Creek.

Amnicola pallida? Hald.—Bleached specimens were common in the denuded banks of the Red River at Winnipeg, and of the Assiniboine at Brandon.

A. granum Say.—Pine Creek.

The Locality for Limnæa involuta Thompson.—Cromaglaun Mountain is seven miles from Killarney, on the road to Kenmare: there is no Cromaglaun Lake, as stated by some conchologists. The Tarn inhabited by *L. involuta* is called Lough Crincaum on the one-inch statute map. It is on a boggy plateau immediately under the apex of the mountain, which is a strictly preserved deer forest; there is no path up and the climb is a severe one. The pool is apparently not more than twenty feet across, and a quarter of it being situate close against the precipice of the upper mountain is inaccessible. My brother and I spent one and a half hours searching for specimens, but unsuccessfully. I heard afterwards they are only found under stones just where the stream runs out down the face of the mountain, but there are certainly none there at present, as neither the gamekeeper (who knows the shells well) nor ourselves could find them. Perhaps owing to the unusual heat they have retired into the mud in the middle of the pool. —WILFRED BENDALL, Sept., 1884.

Marine Mollusca at Oban.—In the 'Journal of Conchology' for 1877 (I. p 275), the Rev. A. M. Norman gave a list of the mollusca which he observed during a short visit. He adds a list of what he did not obtain, though also to be found in the neighbourhood, and notes that it is capable of considerable extension as regards the common forms. With two or three exceptions the following list of species, identified at Oban recently, falls under this description, but it may be worth while to complete the local list so far.

Unless **Anomia striata** Lovén, includes **A. patelliformis** L., it is hard to pass over a fine series of this form.

Pecten septemradiatus Müller. Loch Etive.
Cardium minimum Philippi.
C. Norvegicum Spengl.
Astarte compressa Mont.
Venus exoleta L.
Tellina balthica L.
T. tenuis Da Costa.
Donax vittatus Da Costa.
Solen siliqua L.
Pholas candida L.
Emarginula crassa Sow. Very fine alive in Loch Etive.
Capulus Hungaricus Lin. Small dead shells.
Trochus helicinus Fabricius.
Rissoa reticulata Mont.
Odostomia lactea L.
Natica Islandica Gmel.
N. catena Da Costa.
N. Alderi Forbes.
Lamellaria perspicua L.
Cerithium reticulatum Da Costa.
Nassa reticulata L.

R. D. DARBISHIRE.

DESCRIPTION OF A NEW SPECIES OF PLANORBIS FROM MANITOBA.

By JOHN W. TAYLOR.

Planorbis umbilicatus.

Mr. R. M. Christy, who has paid several visits to Manitoba, kindly placed his collections in my hands for examination. Amongst the Planorbes from Brandon, Birtle, &c., there was a form which I could not with propriety refer to any described species, I therefore propose to name it as above. Mr. Nelson, who has studied the Limnæidæ, agrees with me in regarding the specimens as distinct from any previously described species.

Shell somewhat flat above, but slightly sunk in the centre, convex below, greyish-white, somewhat glossy, closely and distinctly striate in the line of growth, with stronger ridges at intervals, most visible on the under side. Periphery rounded, but slightly compressed at each side. Suture rather deep. Aperture oblique and somewhat cordiform. Umbilicus deep and narrowly funnel-shaped. Whorls 4½, compact, gradually increasing in size and faintly keeled or angulated on upper side. Diam. 6½ mill., alt. 2 mill.

The species bears some resemblance to *P. parvus* Say, but its somewhat funnel-shaped umbilicus is sufficient to at once separate it.

A New Variety of the Cellar-slug—Limax flavus var. **suffusa.**—By this name I propose to characterize a remarkably interesting specimen of *Limax flavus*, taken at Ealing, Middlesex, May 3rd, 1885, by Mr. Sydney C. Cockerell, and most obligingly sent me by that gentleman. The description will stand thus :—

Limax flavus var. **suffusa,**

animal with the shield and body suffused with a uniform dark tinge, caused by the coalescence of the dark markings. The varietal name is intended to signify that the dark markings of both shield and body are fused together into a uniform ash or dark-lead colour, shading off into a lighter tint towards the foot. Owing to this fusion of the markings there is no trace whatever of any pattern, and the animal is altogether of the uniform tint described. The specimen is a moderately adult one, and is now preserved in spirit. It should be remarked that the specimen is not only of the variety I now describe in respect of its markings, but it is also of my var. *grisea* in respect of its colour, and should appear in any county or other list as '*Limax flavus* var. *suffusa* + *grisea*,' if precision and accuracy be required. The yellow colour is altogether wanting in the body, and there are only faint traces of it on the shield-edges. The slime is very pale yellowish. The characteristic blue tint of the tentacles leaves no doubt of the species.—Wm. Denison Roebuck, Leeds, May 8th, 1885.

Zonites nitidulus var. **Helmii in S. Tipperary.**—Mr. Rimmer has kindly sent me a specimen of this variety amongst a number of other species collected the latter part of June at Grantstown near Tipperary. In connection with its occurrence in Ireland I may remark that Mr. Lionel E. Adams, who has so thoroughly explored the neighbourhood of Coleraine in County Derry, informs me that white varieties are very prevalent in that district, though he does not enumerate this particular variety in the list he has kindly furnished me with.—J. W. Taylor, June 28th, 1885.

NOTES ON THE OSWESTRY DISTRICT OF SALOP WITH REFERENCE TO LAND AND FRESH-WATER MOLLUSCA COLLECTED THERE IN JUNE, 1885.

By BAKER HUDSON, M.C.S.

[Read before the Conchological Society.]

Oswestry stands on the outskirts of the Shropshire plain at an elevation of about 420 feet above sea level. It is a town well wooded, the beech, oak, and ash being the most conspicuous trees in point of numbers. Though the town possesses an abundant water supply yet no stream of any size passes nearer to the town than about one mile to the south, where the river Morda runs beneath the high road to Llanymynech. Ponds of a fair size (generally called pools) are numerous, but generally devoid of interest to the conchologist from the fact that the majority of them contain no freshwater shells of any kind, except perhaps in some cases a few Pisidiadæ. The soil generally is of a light porous description, being chiefly a limey or sandy clay. The millstone grit crops out in several places near the town, and slabs of marl slate are obtained for building purposes at no great distance. Coal is worked near Morda village, and to the south of Whittington the soil evidences the nearness of the new red sandstone, and limestone is worked at Porth-y-waen about five miles south-west of Oswestry. The country generally is in a very high state of cultivation, and though well wooded few true woods are in existence.

Several coppices were visited, but so cleared of undergrowth was the ground, that but little resulted from careful searches. The pools too proved, as I have said, comparatively barren, and possibly this might be due to the peaty nature of their margins and the very fine mud which their waters held in suspension. The roadsides and lanes in and around Oswestry were very fully explored—*Helix nemoralis*, *H. hortensis*, *H.*

aspersa, and *H. rufescens* being nearly everywhere abundant, the latter species (*H. rufescens*) invariably among nettles (its partiality for that shelter or food I have many times noticed). *H. nemoralis* seemed to vary more in colour than in banding, whilst of *H. hortensis* I only took the type form, though two or three hundred specimens came under my hands. *H. aspersa* seemed chiefly to tend to var. *undulata*, and many of the specimens were very characteristic. The *albine* variety of *H. rufescens* was, in Morda lane, even more abundant than the type, and was general everywhere. The slugs are both abundant and variable. The major portion of the Oswestry specimens were obtained in a lane near St. Oswald's well. Ellesmere, the largest sheet of water visited, was so agitated by a sharp westerly wind that but little could be done, though it promised to be a capital hunting locality. The canals were generally too well dredged to repay an examination, though such was made, and in one isolated backwater *Paludina vivipara*, *L. stagnalis*, and *Anodon* turned up, the latter in eight feet of water.

The boles of the beech and other trees were examined for *Clausilia*, *Pupa*, &c., but with little avail. *Clausilia rugosa* was plentiful on most old walls, and one specimen of *Balea perversa* occurred to me on the Llanforda road. *Pupa umbilicata* was found once, but the only specimen shared the fate of a box of *L. peregra* from the moat at Whittington, and "is not." A wood at Plas-yn-coed gave me a specimen of *Limax cinereoniger*, several *Zonites*, and *H. aculeata*. Though certainly the excessively hot weather had dried up the soil, I believe the paucity of species, particularly of *Pupa*, *Zonites*, and *Vertigo*, is due to the careful cultivation of the land and the absence of undergrowth in the coppices and woods. *Bulimus obscurus* was found all over Oswestry, principally on old walls and in the hedgerows. *Helix hispida* is anything but common, and *H. rotundata*, which I have got to look upon as "the ever present," though found in most places, was by no means abund-

ant. The river Morda, a quick running stream rushing down a rocky bed, was wonderfully well stocked with *Ancylus fluviatilis*, a single stone the size of one's head often yielding a dozen specimens.

It was intended to visit Lake Bala, but this could not be arranged. Most of the collecting was done whilst out driving, and possibly more might have been done had more time been at my disposal, but I can only hope that the little done may be of some service and help forward the work of the society.

"THE LOCALITY FOR *LIMNÆA INVOLUTA* THOMPSON."

By W. HILL EVANS, M.D., M.C.S., &c.,

In the number of the 'Journal of Conchology' for July Mr. Wilfrid Bendall contributes a notice as above. In the 'Naturalist' for Nov. 1st, 1864, I wrote a short account of an ascent of Cromaglaun and the capture of a dozen of the *L. involuta* in the summer of that year. I was there in wet weather; while Mr. Bendall was there at the close of the very dry summer of 1884, which circumstance will doubtless account for our different ideas as to the extent of the Tarn. He gives it as twenty feet across, when I saw it I feel sure that twenty yards would be much nearer the mark. The hot weather may also have had much to do with his want of success, as it is very possible as he suggests that the mollusks might shelter in the mud. Another cause may have operated—when I was there my guide told me that I should have found a 'power more' had I been there a week earlier, but that a gentlemen from London had a few days before swept the Tarn with a fine net and secured a great number.

This shell, although first described by Mr. Thompson, and very properly associated with his name, was discovered by my cousin, the late Dr. W. H. Harvey, for some time Professor of Botany in the Royal Dublin Society, and the author of a well-known work on British Sea Weeds—'The Phycologia Britannica.'

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY.

Meeting

HELD FEBRUARY 5TH, 1885,

Mr. W. Denison Roebuck, F.L.S., in the Chair.

NEW MEMBER.

Miss E. R. Fairbrass, of Faversham, was elected a Member of this Society. Mr. C. T. Musson, of Mapperley Hill, Nottingham, was nominated for membership.

DONATIONS.

Report of Conference of Delegates from Scientific Societies, held at Montreal, Sept. 1st, 1884; a Catalogue of Natural History Objects, &c., exhibited by Lady Brassey, at Hastings, by Bryce Wright, F.Z.S., F.R.G.S.—the Author.

SPECIMENS EXHIBITED.

The chairman showed the undermentioned shells from Mr. L. B. Ross, F.C.S., of Driffield:—*Unio pictorum*, *Bythinia tentaculata*, *B. leachii*, and *Limnæa glabra*, from York; *Paludina vivipara* and *Limnæa auricularia* from Foston near Driffield; *Pupa marginata*, *Helix pygmæa*, *Carychium minimum*, *Bulimus obscurus*, *Pisidium pusillum*, *Limnæa palustris*, *Ancylus fluviatilis* from Driffield; *Cyclostoma elegans* from Scarborough; *Clausilia rugosa* from Bridlington Quay; *Helix rufescens*, *H. hispida*, *H. sericea*, *H. rupestris*, *H. lapicida*, *Clausilia rugosa*, and *C. laminata* from Canterbury, E. Kent.

Mr. B. Hudson, M.C.S., sent the following for exhibition:—*Valvata cristata* and *V. piscinalis* from Norton, co. Durham; *Helix aculeata* from Kilton Castle near Brotton; *Pisidium pusillum*, *P. fontinale*, and var. *cinerea* from Redcar; *Vertigo edentula* from Airey Holme Wood; *Planorbis spirorbis* from Seaton Carew; *Helix fusca* from near Guisborough.

A collection of sub-fossil shells were shown by Mr. John W. Taylor on behalf of Mr. R. D. Darbishire. They were from Dog's Bay, Roundstone, and included *Helix nemoralis*, *H. pulchella*, *H. aculeata*, *Vertigo substriata*, *V. angustior*, *Vitrina pellucida*, *Zonites crystallinus*, and others.

A specimen of *Helix hortensis*, from Llangorse, with a peculiarly sinuated outer lip was shown on behalf of Mr. F. W. Wotton, Cardiff.

Mr. W. Nelson showed *H. nemoralis* and *H. hortensis* from Maybole, Ayrshire; and Mr. Geo. Roberts showed varieties of the same species from various Yorkshire localities.

Mr. B. S. Dodd, of Nottingham, sent examples of *Helix revelata* from Jersey, *H. lamellata* from Inverary, *Acme lineata* from Huddersfield, and the variety *alba* of the same species from Folkestone.

Meeting

HELD MARCH 5TH, 1885,

Mr. Wm. Denison Roebuck, F.L.S., Presiding.

NEW MEMBERS.

Mr. C. T. Musson was elected a Member of this Society. Mr. Albert Hammond Waters, B.A., of Willoughby House, Mill Road, Cambridge, was nominated for membership.

DONATIONS.

Proceedings of the Linnean Society of New South Wales, vol. ix., part 3; Abstract of Proceedings of the Linnean Society of N. S. W., for Dec., 1884 – by the Society.

PAPER READ.

"On the Organs of Sense in British Land and Freshwater Mollusca," by Robert Scharff, Ph.D., B.Sc., M.C.S., &c.

SPECIMENS EXHIBITED.

Mr. B. Hudson, M.C.S., sent examples of *Vertigo* and a fine specimen of *Zonites nitidus*.

Mr. W. Nelson showed a specimen of *Helix nemoralis* measuring 22 mm. high and 24 mm. in diameter, *H. rotundata* var. *alba*, and *Vitrina pellucida*, all from Whinmoor; also *Limnæa peregra*, *Bythinia tentaculata*, *Paludina sp.?* and *Achatina sp.?* from Tsing Chew Fa, China; and by the kindness of the Rev. A. M. Norman, D.C.L., a tablet of Alder's types of *Planorbis lævis*, from Whitburn.

Mr. J. W. Taylor exhibited a small collection from Kirkcudbright, sent by Mr. F. R. Coles; and Mr. W. Denison Roebuck exhibited on behalf of Mr. Elliott, M.C.S., of Stroud.

Meeting

HELD APRIL 16TH, 1885,

Mr. W. Denison Roebuck, F.L.S., in the Chair.

Minutes of the February and March Meetings were confirmed. Correspondence from several members and societies was brought before the meeting.

NEW MEMBERS.

Mr. Albert H. Waters, B.A., of Cambridge, was elected a Member of this Society. Mr. Hy. E. Craven, Newcastle-on-Tyne, was nominated for membership.

DONATIONS.

The following donations were announced:—Reprints of Papers by Mr. John Brazier, C.M.Z.S., presented by the Author.

1. "Note on Recent Mollusca found in Port Jackson and on the Coast of New South Wales and other localities, with their synonyms."
2. "List of Species of Porcellana or Cypræa found in Moreton Bay, Queensland."
3. "Remarks on some Recently Re-described Australian Shells."
4. "Synonymy of and Remarks upon two Australian Species of Melania."

5. " Habitat of *Cypræa citrina* of Gray."
6. " Critical List of Mollusca from NW. coast of Australia."
7. " Synonymy of Some Land Mollusca from Papua or New Guinea."
8. " Remarks on Some Fluviatile Shells of New South Wales."
9. " Synonymy of Australian and Polynesian Land and Marine Mollusca."
10. " A List of Cypræidæ found on the Victorian Coast, collected by Mr. J. F. Bailey."
11. " Notes on *Bulimus Gunni*."
12. " Check List of the Freshwater Shells of Australia," by Professor Ralph Tate, F.G.S., and John Brazier, C.M.Z.S.

" A List of the Cypræidæ found on the Coast of New Caledonia and Loyalty Islands," by Richard C. Rossiter—Presented by John Brazier, C.M.Z.S

PAPERS READ.

" Census of the Authenticated Distribution of British Land and Freshwater Mollusca," by J. W. Taylor and W. D. Roebuck, F.L.S.

" Description of two New Species of shells—*Scalaria inclyta* and *Bullia pura*—by J. Cosmo Melvill, M.A., F.L.S., M.C.S.

SPECIMENS EXHIBITED.

Mr. J. W. Taylor showed specimens of *Testacella Maugei* from Clifton, sent by Miss F. M. Hele. Also the following, sent by Mr. R. D. Darbishire, F.G.S., which had recently been collected at Arcachon, Gironde :—*Helix aspersa*, *H. pisana*, *H. hortensis*, *H. concinna*, *Cochlicopa lubrica*, and *Succinea putris*.

On behalf of Mr. H. P. Fitzgerald M.C.S., *Limnæa peregra* monst. *decollatum* from Preston Candover, N. Hants, was exhibited.

Mr. W. Denison Roebuck showed several species of Zonites from Roche Abbey and Anston Crags. Also on behalf of Mr.

S. C. Cockerell various Middlesex species were shown, amongst which were *Planorbis vortex* and *P. albus* from Hampton Court, and *Zonites crystallinus*, *Z. nitidus*, *Carychium minimum*, and others from Twickenham.

Specimens of *H. nemoralis*, *H. ericetorum* and the variety *minor*, from the Island of Islay, were shown on behalf of Mr. R. S. Skirving, of Edinburgh; and for Mr. J. E. Mason an example of *Sphærium corneum* from Alford was exhibited.

Meeting

HELD MAY 7TH, 1885.

Mr. W. Denison Roebuck, F.L.S., presiding.

Minutes of previous meeting were confirmed.

NEW MEMBER.

Mr. Hy. E. Craven was elected a Member of this Society.

SPECIMENS EXHIBITED.

On behalf of Mr. Elliott of Stroud, M.C.S., specimens of *Sphærium rivicola*, *Limnæa stagnalis*, *Paludina vivipara*, *Dreissena polymorpha*, and numerous other species from Gloucestershire, were exhibited.

Mr. J. W. Taylor showed shells from Rewggan near St. Columb, Cornwall, including fine varieties of *Helix aspersa*, *H. nemoralis*, *H. hortensis*, and *H. sericea*.

Mr. W. Denison Roebuck, F.L.S., exhibited several slugs from Cheshire, sent by Mr. J. G. Milne, amongst which were *Limax maximus* from Bowdon, and *Arion hortensis* from Bollington; also numerous slugs from Eavestone, Ripon, sent by Mr. Ingleby, including *Limax lævis* and fine varieties of *Limax agrestis* and *Arion ater*. Mr. Roebuck further showed a new variety of *Limax flavus* from Ealing, Middlesex, sent by Mr. S. C. Cockerell.

Meeting

HELD JUNE 4TH, 1885.

Mr. Wm. Nelson occupied the Chair.

Correspondence from several members and societies was brought before the meeting.

Mr. J. W. Taylor read a communication from Mr. Bryant Walker, of Moffat Buildings, Detroit, Michigan, U.S.A., asking members of the Conchological Society to exchange British and European land and freshwater shells for species from Michigan and adjacent States. Mr. Walker has about one hundred duplicate species, exclusive of Unionidæ, that he can dispose of.

NEW MEMBER.

Mr. Lionel Adams, B.A., 5, Park Street, Stafford, was nominated for membership.

DONATIONS.

The following donations were brought before the meeting:

"The Darts of British Helicidæ."—Mr. C. Ashford.

"Proceedings of the Linnean Society of New South Wales," vol. ix., part 4.—The Society.

"Rules and List of Members of the Linnean Society, N.S.W."—The Society.

"Abstract of the Proceedings of the Linnean Society, N.S.W."—The Society.

PAPER READ.

"A Supplementary Authenticated List of the Mollusca of Northamptonshire," by Mr. W. Denison Roebuck, F.L.S.

SPECIMENS EXHIBITED.

Mr. R. Scharff, Ph.D., B.Sc., sent a small box of shells from Chingford, S. Essex, amongst which were examples of *Limnæa auricularia*, *L. peregra*, *L. truncatula*, *Planorbis vortex*, *P. contortus*, *P. albus*, *P. carinatus*, *Paludina vivipara*, and *Sphærium corneum*.

Mr. John W. Taylor showed a series of shells sent by Mr. C. Platania-Platania of Acireale, Sicily, which included *Limnæa palustris*, *L. peregra*, *L. ovata*, *Cyclostoma elegans*, *Helix pisana*, and others. Mr. Taylor also exhibited collections from St. Evats, West Cornwall, sent by Mr. W. Vinson; and from St. Colomb, East Cornwall.

An example of *Limax maximus* var. *Mulleri*, sent by Mr. Musson, from Mapperley, Notts., was also shown. This is the first recorded occurrence of this variety in Britain.

Mr. Roebuck showed several varieties of *Arion ater* and other slugs from St. Colomb, Cornwall; also numerous slugs sent by the President, Mr. W. Jeffery, Mr. B. Hudson, and other correspondents.

Meeting

HELD JULY 2ND, 1885.

Mr. W. Denison Roebuck, F.L.S., Vice-President, in the Chair.

NEW MEMBERS.

Mr. Lionel E. Adams was elected a Member of the Society. Mr. Ernest D. Marquand, Regent House, Penzance, was nominated for membership.

DONATIONS.

"Bulletin of the Brookville Society of Natural History," Brookville, Indiana, U.S.A.—The Society.

A specimen of *Limnæa stagnalis* var. *labiata* with an immense growth of confervæ.—The President.

Anodonta herculeus Gerst.—Mr. R. D. Darbishire, F.G.S.

PAPERS READ.

"Notes on the Land and Freshwater Mollusca of the Lower Tees," by Mr. Baker Hudson. "Notes on the Oswestry District of Salop, with reference to Land and Freshwater Mollusca, collected there in June, 1885," by Mr. Baker Hudson.

SPECIMENS EXHIBITED.

A large collection of shells were shown by Mr. Baker Hudson from the Oswestry District of Salop, particulars of which are entered in the Society's Record Book.

Four living specimens of *Limnæa involuta*, sent by Mr. F. de V. Kane, M.A., from Lough Crincaum, Cromaglaun Mountains, Co. Kerry, were shown; also drawings made by Mr. Taylor from living specimens sent from the same locality by Messrs. S. A. Stewart, F.B.S.E., of Belfast, and G. A. Holt, of Manchester.

Examples of *Limax arborum* and *L. cinereo-niger* from Killarney, sent by Mr. Kane, were exhibited by Mr. W. D. Roebuck, who observed that the *Limax cinereo-niger* was new to the fauna of Ireland. Mr. Roebuck further showed a number of slugs, including *Amalia marginata* var. *rustica*, sent by Mr. H. P. Fitzgerald.

Small collections of shells were also exhibited by Mr. J. W. Taylor—one from South Tipperary (District 144), sent by Mr. R. Rimmer, F.L.S.; and one from Forfarshire, from Mr. Duncan, of Montrose.

A specimen of *Anodonta herculeus* Gerst. was exhibited by Mr. Taylor, and presented to the Society on behalf of Mr. R. D. Darbishire, to whom a vote of thanks was awarded.

Mr. Taylor also exhibited, on behalf of the President, a living specimen of *L. stagnalis* var. *labiata*, on which there was an immense growth of confervæ, the vegetation being four or five inches long. This specimen was presented to the Society, and a vote of thanks was unanimously carried.

Meeting

HELD AUGUST 27TH, 1885.

Mr. W. Nelson, Vice-President, in the chair.

The minutes of three previous meetings were confirmed.

NEW MEMBERS.

Mr. Ernest D. Marquand, Penzance, was elected a Member of the Society. Mr. Kenneth McKean, F.L.S., Croydon, Mr. Frederic G. Fenn, 20, Woodstock Road, Chiswick, and Mr. T. D. A. Cockerell, 51, Woodstock Road, Chiswick, were nominated for membership.

SPECIMENS EXHIBITED.

Specimens of *Limax lævis* from Ratham, Chichester, were shown on behalf of the President, Mr. W. Jeffery.

Mr. Roebuck showed a collection of shells sent for authentication, by Mr. Charles Ashford, from counties not hitherto represented in the census.

A large and interesting collection of shells, from various localities, was shown on behalf of Mr. T. D. A. Cockerell, of London; as, also, coloured drawings of *Helix pomatia* and of *Arion ater*.

Mr. Taylor exhibited for Mr. Ramage, of Dundee, a number of shells from that locality; included were examples of *Helix nemoralis*, *Cochlicopa tridens*, *Hyalina nitidula*, *Ancylus fluviatilis*, and *Limnæa peregra*. Also from Mr. R. D. Darbishire, of Manchester, a collection of shells from Lago di Garda, Landser See, &c., collected by Mr. A. W. Waters, including *Limnæa stagnalis*, *L. palustris*, *Neritina fluviatilis*, *Planorbis carinatus*, and var. *disciformis*. From Mr. West, of Bradford, a collection consisting mainly of Yorkshire specimens —amongst others, *Azeca tridens*, *Pupa ringens*, and *H. sericea*, from Ingleton. Mr. Wotton, of Cardiff, sent *Planorbis nitidus* and *Valvata piscinalis* from that neighbourhood.

Meeting

HELD SEPTEMBER 10TH, 1885.

Mr. Wm. Nelson presided.

Minutes of the August meeting were read and confirmed.

NEW MEMBERS.

Messrs. Kenneth McKean, F.L.S., F. G. Fenn, and T. D. A. Cockerell were elected Members of the Society.

DONATIONS.

"Abstract of the Proceedings of the Linnean Society of New South Wales," for May and April, 1885.

"Proceedings of the Royal Society of Queensland," vol. i., parts 2, 3, and 4.

SPECIMENS EXHIBITED.

A living specimen of *Planorbis corneus* var. *albida*, was sent for exhibition by the President, Mr. W. Jeffery. On behalf of Mr. C. Ashford, an example of *Sphærium pisidioides*, from River Chelmer, was shown by Mr. J. W. Taylor. Also for Mr. T. Rogers, *Pisidium nitidum* var. *globosa* and *P. pusillum* from Swinton, near Manchester. Also on behalf of Mr. R. D. Darbishire, a collection from Seville and Valencia, in Spain; and a collection made at Naples by Mr. A. W. Waters. A collection was shown from Volhynia, in Russia, sent by Dr. Viner. A large and fine collection of shells from Coleraine, in the North of Ireland, was exhibited on behalf of Mr. L. E. Adams. It included *V. alpestris*, and a peculiar and beautiful banded example of *V. pellucida*.

Mr. W. D. Roebuck showed a number of shells from various localities. The series included *Paludina vivipara*, sent by Rev. W. C. Hey. This specimen, taken from the Ouse a mile above York, was slightly scalariform, approaching *P. contecta* in form; and was, singularly enough, from the exact locality for which a solitary example of *P. contecta* is on record. *Paludina vivipara*, a dead specimen, from high water mark at Bridlington, found by Mr. G. Wingate. Good examples of *Limnæa peregra* var. *labiosa*, from a pond at Bredbury, Cheshire, and *Sphærium corneum* var. *scaldiana* from Peak Forest Canal, Hyde, Cheshire, sent by Mr. C. Oldham. *Helix lactea* found on the coast at Scarborough, with the animal still in it, by Mr. J. H. Salter.

NOTE ON "*ANODON HERCULEUS* GERSTFORD" (?)

BY EDGAR A. SMITH, F.Z.S., &c.

Zoological Department, British Museum.

In the last part of this Journal Mr. Darbishire made a few observations on some valves of a species of Unionidæ, to which he has applied the above name. He has since very liberally presented two of them to the British Museum, and I am thus enabled as far as Reeve's book, the 'Conchologia Iconica," is concerned, to concur with Mr. Darbishire's identification of the species. It may however be of use to point out that the Monograph of *Anodon* in that work was written by Sowerby and not by Reeve, the latter author's last monograph being that of *Tornatella*, which together with seven others occupy the first half of the fifteenth volume; the last half of that volume and the five concluding volumes were also produced by the late G. B. Sowerby. No species bearing the name '*Anodon herculeus*' was ever published by 'Gerstford,' which is apparently a mis-spelling of Gerstfeldt, who in his account of the land and freshwater mollusca of Siberia and Amurland of course enumerates this species, which was originally described as *Anodonta herculea* by Middendorff. It is not a true *Anodonta*, but belongs to *Dipsas* (=*Symphynota*=*Barbala*), and is considered by Lea synonymous with the well-known *D. plicatus*, but whether rightly so or not I do not pretend to say, not having sufficient material upon which to base a satisfactory opinion, although I am inclined to believe the determination is correct.—Aug. 10th, 1885.

Planorbis subangulatus at Malta.—Capt. Becher, in his paper on Maltese shells, only mentions one species of Planorbis, a form of *P. glaber*, as inhabiting that Island. There are six shells in the British Museum labelled "*subangulatus* Phil., Malta," which are in no way related to *P. glaber*, but appear to resemble a light form of *P. complanatus* v. *rhombea*, but are possibly distinct from that species.—T. D. A. COCKERELL, M.C.S., July 24th, 1885.

SHELLS COLLECTED AT LLANDULAS, NORTH WALES, DURING A BRIEF VISIT IN AUGUST LAST.

By EDWARD COLLIER, M.C.S.

[Read before the Conchological Society]

In August last I paid a brief visit to Llandulas, and, although, I only collected shells on two days, I managed to secure 29 species and varieties. I have no doubt more would have been found if I had made a longer stay. They were all obtained within a mile of the village church, and that in only one or two directions. If I had had time to have gone further up the valley, or have explored some of the woods on the hill side, I have no doubt I should have found a few more species. Llandulas is situated on the limestone, and there are some extensive quarries worked there. The slugs I did not collect.

1. **Limnæa peregra.**—Common in the small stream which runs down not far from the church.
2. **Ancylus fluviatilis.**—Very plentiful in the stream along with *L. peregra.*
3. **Zonites cellarius.**—Common.
4. **Z. glaber.**—In a dark wood by the road-side not far from the village. I have always found this species in very shady places, never having found it without plenty of cover.
5. **Z. alliarius.**—Common.
6. **Z. alliarius** var. **viridula.**—One specimen only.
7. **Z. nitidulus.**—Not very common.
8. **Z. purus.**—Rare.
9. **Z. crystallinus.**—Not common.
10. **Z. fulvus.**—One specimen only—under a stone by the road side.
11. **Helix aculeata.**—Six specimens under stones in a small plantation.
12. **H. aspersa.**—Generally distributed; very plentiful under stones amongst bushes close to the sea.

13. **H. nemoralis.**—Not very common; along with the former species.
14. **H. hortensis.**—Rare; one or two specimens about half a mile up the valley.
15. **H. concinna.**—Common.
16. **H. sericea.**—One specimen only; not fully grown.
17. **H. virgata.**—Very plentiful on the shore not far from the sea, and also all the way to Pensarn.
18. **H. caperata.**—On the shore, not far from the railway bridge; not very plentiful.
19. **H. caperata** var. **ornata.**—One specimen only.
20. **H. rotundata.**—Common; but very large specimens.
21. **H. pulchella.**—Plentiful; in a small stony wood on the hill side.
22. **H pulchella** var. **costata.**—With the preceding.
23. **Bulimus acutus.**—Very plentiful along the shore; but could not find the variety *bizona*.
24. **B. obscurus.**—One specimen only.
25. **Pupa umbilicata.**—Under stones near the sea, along with *Helix aspersa*.
26. **P. marginata.**—Rare.
27. **Clausilia rugosa.**—Common.
28. **Cochlicopa lubrica.**—Rare.
29. **Carychium minimum.**—In the wood, along with *Helix pulchella*; common.

Helix pisana var. **alba at Rush, Co. Dublin.**—I have received examples of this pretty variety from Mr. J. R. Redding, of Dublin, taken at the above locality. They are true albinisms, with translucent bandings, and no vestige of colour. The cream-coloured var. *alba*, which one sees so often from Tenby, is parallel to the var. *albicans* of *H. virgata*, and bears the same relation to the type. The two forms should not be classed together, as they are quite distinct—the one being apparently the result of suppression of bands, and the other of absence of colouring matter.—SYDNEY C. COCKERELL, M.C.S.

J.C., iv., October, 1885.

THE LAND MOLLUSCA OF BRISTOL COUNTY, MASSACHUSETTS, U.S.A.

By JOHN H. THOMSON, C.M.Z.S., &c.

Bristol county comprises a portion of the south part of Massachusetts, situated on a part of Buzzard's Bay and the Atlantic Ocean, the portion which I have explored for mollusca comprises the south part of the same, viz., the city and towns of New Bedford, Dartmouth, and Westport, together with the adjoining town of Tiverton, Rhode Island. In the latter town, a high rocky ridge on the west shore of Stafford Lake has afforded me many specimens of our minute species not found elsewhere in the region examined, and one species *Hyalina Wheatleyi*, Bland, found only hitherto in Tennessee, more than 1000 miles south of this locality. Not having studied the fluviatile species for many years, I do not feel competent to catalogue them. The towns of Westport and Tiverton contain several large "ponds" or lakes, mostly surrounded by dense woods, and in these locations I have been most successful in my gleanings.

Hyalinia cellaria Müller.—New Bedford. Introduced.

H. nitida Müll.—Having some years ago found specimens in Tiverton, Rhode Island, on the "rocky heights" before spoken of, I submitted some of them to the late Dr. Lewis and he decided they were this species.

H. arborea Say.—New Bedford, Dartmouth, Westport, and Tiverton. Abundant.

H. electrina Gould.—Westport and Tiverton. Not common. I doubt the identity of this shell with *H. viridula* Menke. Found near water under sticks, logs, &c.

H. indentata Say.—Dartmouth, Westport, and Tiverton.

H. minuscula Binney.—Westport and Tiverton. Rare; found with preceding species.

H. milium Morse.—Tiverton. Very rare.

H. binneyana Morse (=*H. morsei* Tryon).—Westport. Very rare.

H. ferrea Morse.—Tiverton "rocky ridge." Very rare.

H. wheatleyi Bland.—Tiverton. Rare; found with *H. ferrea.*

H. exigua Stimpson.—Westport. Very rare.

H. chersina Say (=*H. egena* Say).—Dartmouth, Westport, and Tiverton. This is certainly distinct from *H. fulva* Drap. Found under damp leaves near the shores of the "ponds."

H. multidentata Binney.—Westport and Tiverton. Very rare; high ridges.

Vitrina limpida Gould.—Westport. Under old boards at an old saw mill. Very thin and transparent.

Limax flavus L.—New Bedford. Introduced; I found them numerous in my garden.

L. agrestis L.—New Bedford. Introduced; same locality.

L. campestris Binney.—Westport and Tiverton. Under rocks and fallen trees in old pastures.

Tebennophorus carolinensis Binney.—Westport. In woods under logs; rare.

Arion fuscus Müll. (=*A. hortensis* Binney).—New Bedford. Introduced; in yards and gardens.

Pallifera dorsalis Binney.—Westport. I once found several specimens many years ago in the peaty soil under old logs; very rare.

Patula alternata Say.—Common near the sea coast; often found hibernating in masses of 50 to 75 individuals in holes under old sods and leaves.

P. alternata var. **fergusoni** Bland.—Westport and Tiverton. Rare.

P. striatella Anthony.—New Bedford, Dartmouth, Westport, and Tiverton. Common.

P. asteriscus Morse.—Westport. Very rare; under dead maple leaves near swampy places.

P. lineata Say.—Westport. Not common; under chips and stones around old houses.

Ferussacia subcylindrica L. (=*Zua lubrica* Leach).—Westport and Tiverton. Under bits of wood and boards in dry locations. I can see no difference between this and European species—there are slight variations among all.

Pupa muscorum L. (=*P. badia* Adams).—Dartmouth and Westport. Common; but not one in 50 has the parietal tooth. W. G. Binney decides this and the European species to be identical. Morse thinks them diverse (*vide* Portland Soc. Jour.). Found only by me near the salt water in old dead trees and stumps.

P. pentodon Say.—Westport. Found near foot of trees among moss and leaves near water holes. Rare.

P. fallax Say (=*B. marginatus*, Pfr., Tryon, &c.).—Tiverton. On the rocky ridge near Tiverton, Rhode Island, among oak trees. Rare.

P. armifera Say.—Tiverton. Rare; I found some near the shore of Stafford Lake. I can compare to no other species.

P. contracta Say ?—Westport. Rare and very local. More elongate than the type.

P. corticaria Say.—Found some years ago on the island of Naushon, Buzzard's Bay, under the bark of an old beach tree. Not yet found in Bristol county.

Vertigo gouldi Binney. — Westport and Tiverton. Not common.

V. bollesiana Morse.—Rare. I found three specimens with *V. gouldi*, which I think are the species of Morse.

V. milium Gould.—Westport. Not rare. I have found them mostly in the green moss hanging from white oak trees.

V. ovata Say.—Westport and Tiverton. Common.

V. simplex Gould.—Westport. Rare in damp places in interstices of old logs with *H. electrina* Gould.

Punctum minutissimum Lea.—Westport and Tiverton. Local, but very gregarious, when one is found a search will detect them quite numerous close by. Mr. Wm. G. Binney decides this species=*P. pygmæum* Drap. It is difficult to decide owing to its size.

Strobila labyrinthica Say.—Dartmouth and Westport. In forests of maple and birch under dead leaves.

Stenotrema monodon Racket.—Westport and Tiverton. Not rare. Found in old pastures and orchards.

S. monodon var. **fraterna** Say.—Westport and Tiverton. Found in old pastures and orchards.

Mesodon albolabris Say.—New Bedford, Dartmouth, Westport, and Tiverton. Common in forests and old pastures.

M. albolabris var. **dentata**.—New Bedford, Dartmouth, Westport, and Tiverton. Common in forests and old pastures.

M. thyroides Say.—New Bedford, Dartmouth, Westport, and Tiverton. Widely scattered. I have found them most abundant on hill sides near salt water. I found some years since on Palmer's Island, in our harbour a fine variety of a dark red-brown colour and the lip a fine pink, which, however, fades after a time.

M. sayii Binney.—Westport and Tiverton. Very rare. I have only found it near streams of water.

Acanthinula harpa Say.—Westport and Tiverton. Found in groves of maples among the leaves and moss.

Vallonia minuta Say.—Dartmouth and Westport. Common. In dry places under chips and stones. I cannot consider this species to =*H. pulchella* Müller.

Fruticicola hispida L.—Introduced. Although not in the limits of the county, I received several specimens some years

since collected on the Island of Martha's Vineyard, near "Gay head," differing in no way from European specimens, except being thinner and lighter.

F. rufescens Pennant.—I found a few *living* on the Island of Naushon (Buzzard's Bay), on the south side near the "French watering place," in 1859 *or* 1860.

Succinea ovalis Gould, *nec* Say.—New Bedford, Dartmouth, and Westport. Common.

S. avara Say.—Westport. Very local.

S. obliqua Say (=*S. ovalis* Say =*S. campestris* Auct. non Say).—Tiverton, Rhode Island. Very variable, but generally the typical form is found in swaley places on hill sides; very nearly allied to *S. ovalis* Gould.

S. totteniana Lea.—Westport and Tiverton. Rare. Very much like *S. obliqua* Say, but thinner and more like a pellicle.

Tachea hortensis Müller.—I have found large numbers of the bright lemon-yellow variety of this shell on Martha's Vineyard, near "Gay head," never on mainland. Of course, introduced from Europe. I tried some in my garden, but the slugs, "Limax, Arion, &c.," devoured the young, and I could never succeed in getting mature specimens.

Helix ericetorum at Llandudno.—In Mr. Roebuck's list of Llandudno mollusca ('Journ. Conch.') no mention is made of this species. The Rev. Hilderic Friend has sent me several specimens from that locality, where he says it was plentiful in one spot. The specimens are interesting on account of the unusual breadth of the band above the periphery, which in one or two even reaches the suture. Several belong to the var. *alba*, and have translucent and colourless bands.—T. D. A. Cockerell, M.C.S.

ABNORMAL SPIRAL BANDING IN OUR LAND AND FRESHWATER MOLLUSCA.

By SYDNEY C. COCKERELL, M.C.S.

My attention having been called to the occasional appearance of spiral lines in some or all of our land and freshwater species, I have recently taken note of every instance which has come under my observation. I append a list:—*Bythinia tentaculata*, *Planorbis complanatus*, *P. corneus*, *Physa hypnorum*, *P. fontinalis*, *Limnæa glutinosa*, *L. peregra*, *L. auricularia*, *L. stagnalis*, *L. palustris*, *Zonites cellarius*, *Z. glaber*, *Z. nitidulus*, *Z. nitidus*, *Helix rufescens*, *H. hispida*, *H. rotundata*, *Bulimus obscurus* and var. *albinos*, *Clausilia rugosa*, *C. laminata*. The lines and bands in question are of an opaque white, often very numerous, sometimes confluent. It is difficult to come to a decision respecting the cause of these bands, but if they be due to reversion, they are less likely to represent original bands now suppressed than the space between such bands or groups of bands. I cannot help thinking that the ordinary colouring in unbanded species is in most, if not all, cases the result of the confluence of an indefinite number of bands originally distinct. If it be true that in all cases of genuine albinisms of species normally banded (*e.g.*, *Helix hortensis*, *H. pisana*, *H. virgata*, &c.), the banded portion alone assumes a translucent aspect, the fact of the albinisms of all our unbanded species being entirely transparent is all in favour of such a supposition; and the opaque white band on a translucent *Bulimus obscurus* must represent, if anything, the original ground colour. In some few species, such as both our *Physæ*, *Limnæa palustris*, and notably *Planorbis lineatus*, the transformation seems to have been incomplete, an opaque white region at the suture being sometimes

or always present; while in *Helix virgata* and others the process would appear to be still in active operation. Of course, before coming to any definite conclusion on this head, it would be necessary to make a careful study of the foreign species. Meanwhile the opinions of more experienced conchologists would be of interest.

New Varieties of Limax arborum and Arion ater.—During the past year I have been indebted to my friend, Mr. F. de Vismes Kane, M.A., M.R.I.A., of Dublin, for numerous consignments of slugs from various parts of Ireland, which have been of the greatest possible interest. A report on them will be submitted, through him, to the Royal Irish Academy. But here it will be well to characterize two forms which appear to be very distinct from anything hitherto described. The first is a form of *Limax arborum* from Enniscoe Demesne, near Crossmolina, West Mayo, sent to me on the 29th of September, and which I propose to call

Limax arborum var. **maculata.**

This variety has the ground colour as in the typical form of the species, with the markings reduced to small and sharply-defined black spots of rounded or elongated form, and a thin continuous longitudinal band on each side, which shows a tendency to break up into spots. The nebulous or cloudy markings of *L. arborum* are, in this case, entirely replaced by the black spots. This variety was accompanied by others of the species, including typical specimens and examples of vars. *bettonii* and *nemorosa*; the consignment further included numerous other slugs. The second new variety which I have to bring forward is one which I propose to call

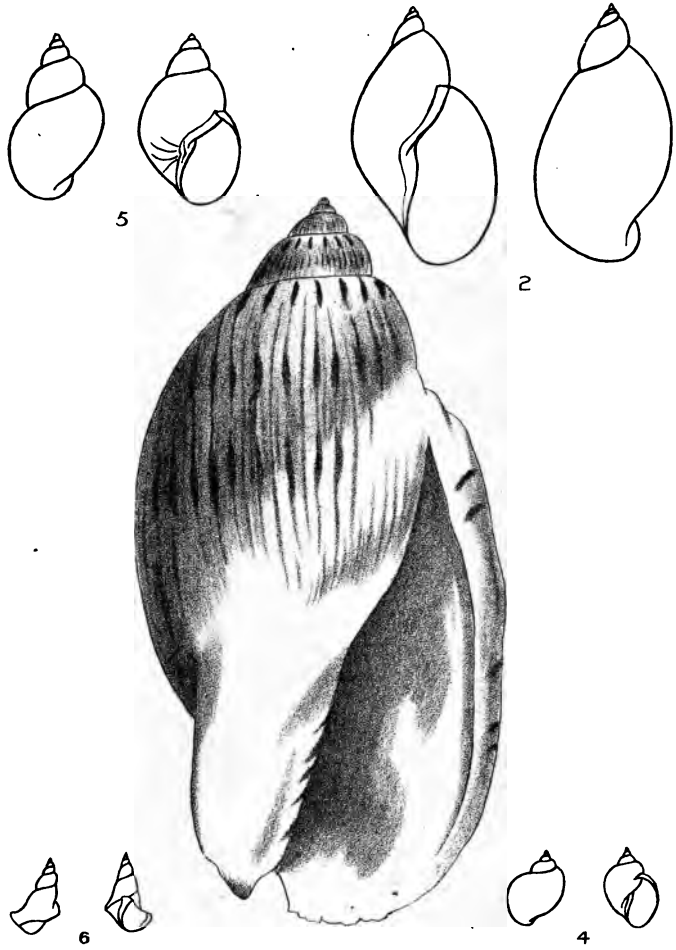
Arion ater var. **reticulata.**

In this the animal has the rugosities very pale dirty yellow or nearly white and the interstices between them grey, giving the

whole body a beautifully distinctly reticulated appearance. The shield is uniform grey, and the foot-fringe is pale and rather dirty orange tawny, with the usual black streaks. This specimen is about half-grown, and was sent me by Mr. Kane on the 10th November, from the neighbourhood of Mallow, North Cork (judging from the post-mark). With it were numerous other slugs, an account of which I reserve for my paper for the Royal Irish Academy. I will, however, here say that the slug-fauna of Ireland, so far as Mr. Kane's numerous and extensive consignments show, has a marked character of its own, and offers numerous forms of variation not usually observed by English collectors.—W. DENISON ROEBUCK, Sunny Bank, Leeds.

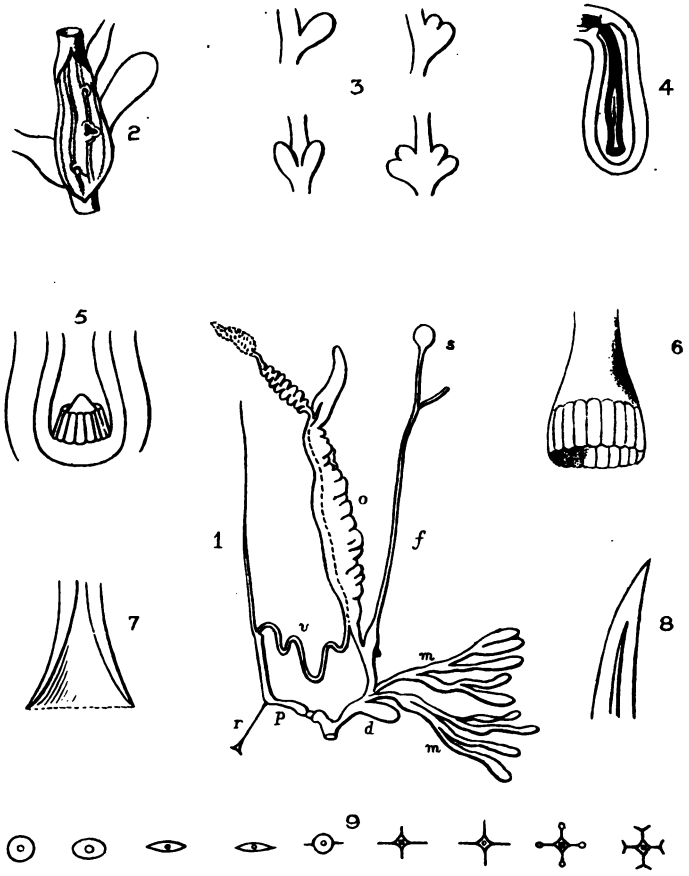
Ancylus fluviatilis var. **costata** Fér.—This variety is described by Baudon ('Journ. de Conch., 1884') as being distinguished from the type by striæ, more or less marked, from the summit to the base. Captain Brown (Recent 'Conch. of G. B.') mentions a variety which exactly agrees with this definition as being found in a stream near Folkestone. This variety ought therefore to be added to the British list.—T. D. A. COCKERELL, M.C.S.

Pupa marginata var. **brevis** Baudon **in Britain.**—Amongst some shells collected by Mr. W. Denison Roebuck on June 27th of present year, at Runswick Bay near Whitby, I found a very characteristic specimen of this variety, which has not previously been recorded as British. It is described by Baudon as "Très raccourcie, robuste, bourrelet épais, blanc au peristome." The average size of the type as given by Dr. Jeffreys is 0·133, or about 3¼ mill., and breadth 0·6, the latter presumably an error for 0·06 which is equal to about 1½ mill. The specimen of var. *brevis* is 2 mill. long and about 1½ mill. broad, is composed of a whorl less than usual, and the mouth being perfectly finished shows it to belong the edentate form of the species.—J. W. TAYLOR.

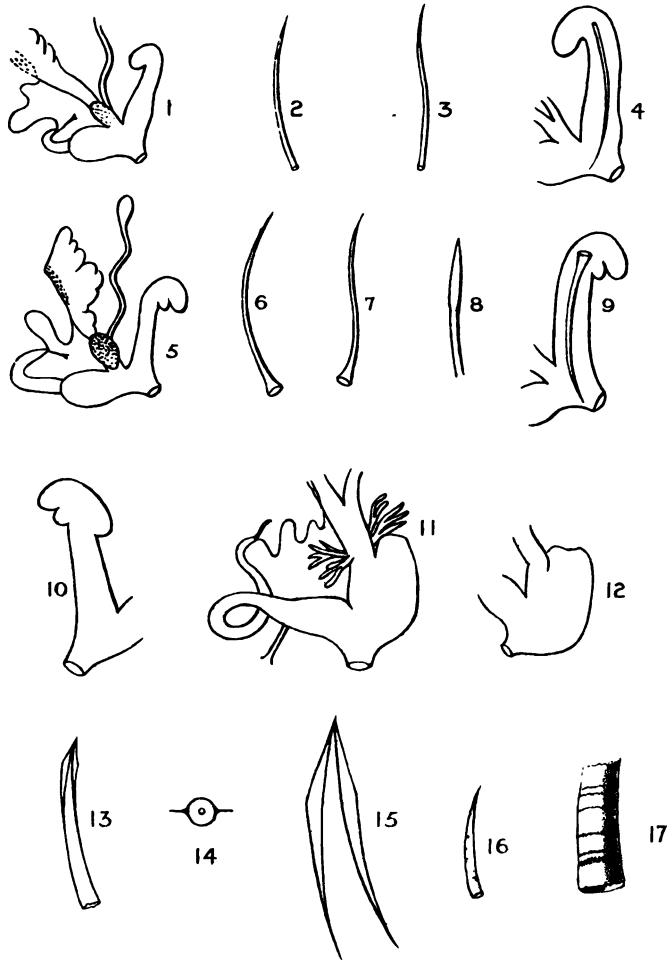


1, *Cassis kalosmodix*, Melvill. 2, *Limnæa peregra* var. *stagnaliformis* Taylor. 4, *Limnæa palustris* var. *globosa* Taylor. 5, *Limnæa palustris* var. *obesa* Taylor. 6, *Limnæa palustris* monst. *carinatum* Taylor.

Plate II. *Vol. IV.*



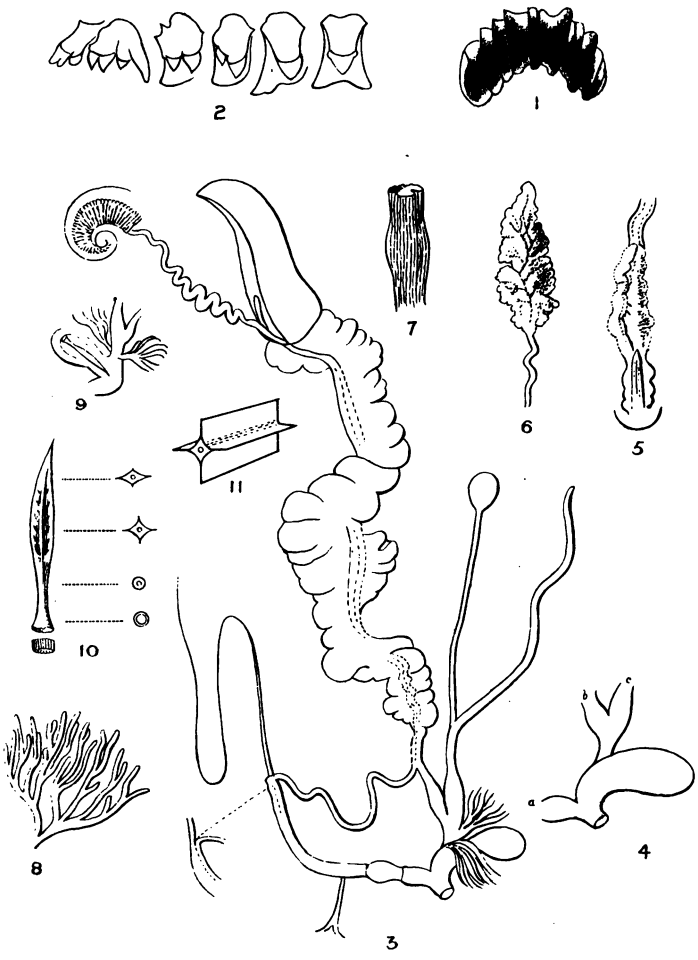
1. Reproductive organs of *Helix hortensis* nat. size ; *d*, dart-sac ; *m*, mucous glands ; *s*, spermatheca with its duct and branch ; *o*, oviduct ; *p*, male organ ; *r*, retractor muscle ; *v*, vas deferens ; *f*, flagellum. 2, Vaginal tube laid open showing outlet of dart-sac. 3, Four types of dart-sac. 4, Section of dart-sac. 5, Annulus *in situ* on the tubercle. 6, Base of dart attached to annulus. 7, Section of base of dart. 8, Section of point. 9, Diagrammatic sections of darts arranged from simple to complex.



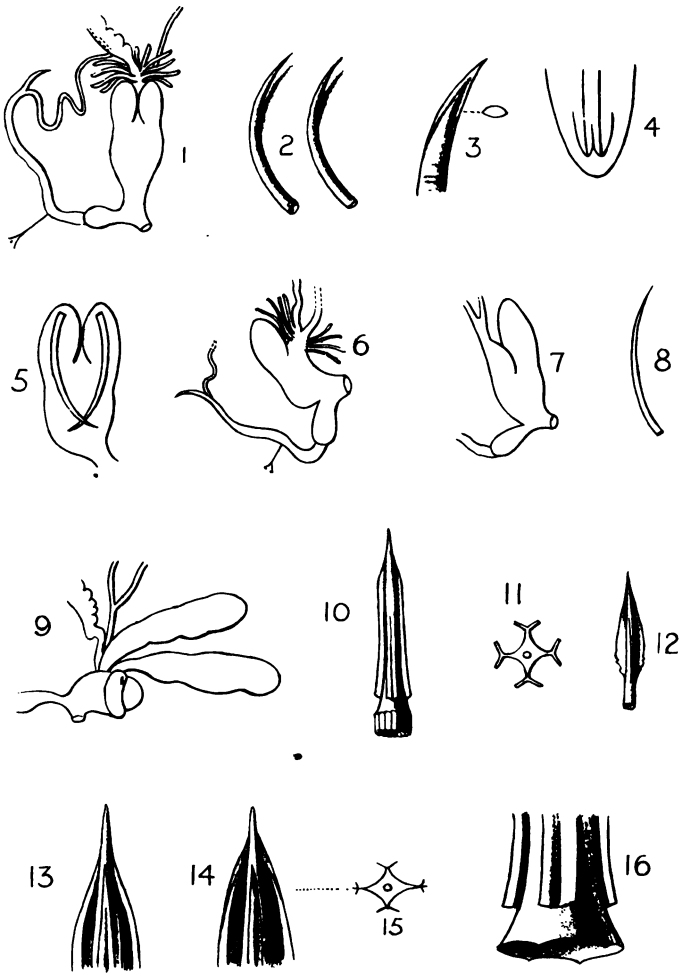
Zonites nitidus Müll.—1, Dart-sac and adjacent parts, × 7. 2, Dart, × 10. 3, Side view of same showing the twist. 4, Dart in its sac.

Zonites excavatus Bean.—5, Dart-sac, × 7. 6, Dart, × 10. 7, Side view of same. 8, Head more enlarged. 9, Dart in its sac. 10, A deformed dart-sac.

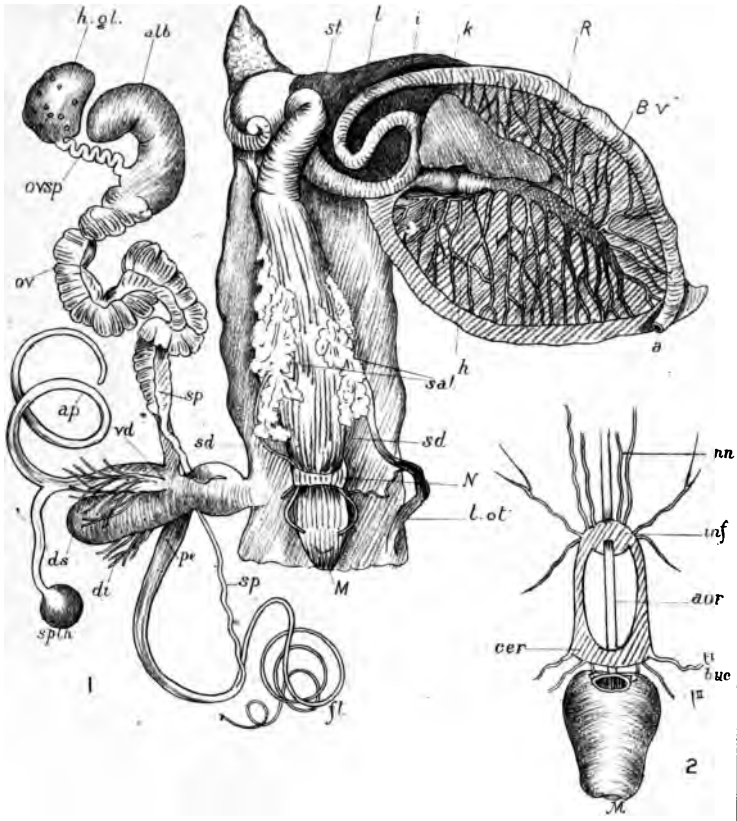
Helix virgata Da Costa.—11, Dart-sac, × 3. 12, Another with indented end. 13, Dart, × 7. 14, Section of head. 15, Head more enlarged. 16, Immature dart. 17, Base of dart.



Helix aspersa.—1, Jaw. 2, Teeth. 3, Dissection showing reproductive organs. 4, A portion enlarged; *a*, penis sheath; *b*, oviduct; *c*, duct of spermatheca. 5, Salivary glands (nat. size) on the æsophagus. 6, One gland and duct enlarged. 7, Æsophagus above salivary glands. 8, A bundle of mucous glands, × 2½. 9, Dart *in situ*. 10, Dart, × 3 with sections. 11, Oblique section of dart (enlarged).



Helix ericetorum. **1,** Pair of dart-sacs × 3. **2,** Darts × 4. **3,** Head enlarged. **4,** Section of base of dart-sac. **5,** Darts in position.
Helix caperata. **6,** Dart-sac × 4. **7,** Other side of same. **8,** Dart × 6
Helix pisana. **9,** Dart-sac × 2. **10,** Dart × 10. **11,** Mid-section of dart. **12,** Immature dart. **13-14,** Heads of darts enlarged. **15,** Section of last. **16,** Base of dart enlarged.



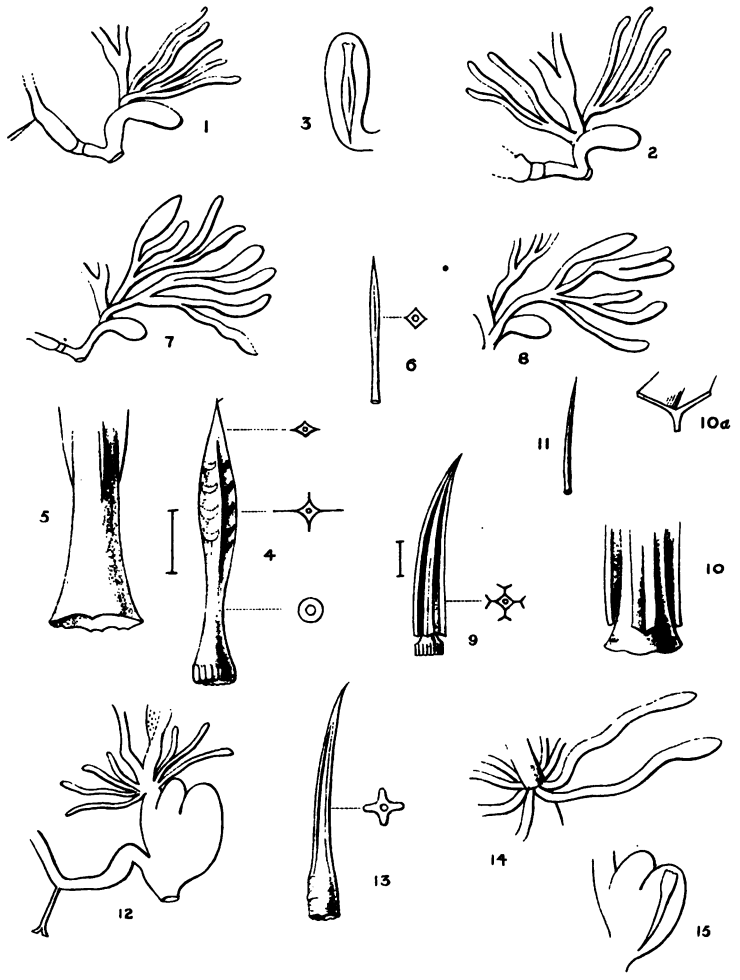
ANATOMY OF *HELIX ASPERSA.*

FIG. 1.—The shell has been removed by cutting along the suture. The respiratory chamber is laid open by a cut extending from the respiratory orifice along the transverse line of fusion of the mantle, and by another cut on the right side, passing backwards along the extreme right hand limit of the chamber, so as to leave the anus, rectum, and kidney in continuity with the mantle-roof of the chamber. A complete view of the digestive organs has been obtained by opening the dorsal integument by a median cut extending from the head to the spirally twisted hump, and by carefully separating the alimentary tract from its attachments. The liver has been partially removed in order to expose the convolutions of the intestine, and the generative organs have been pushed to the right side.

R. rectum—k. kidney—h. heart—a. anus—i. intestine—l. liver—st. stomach—B.V. blood vessels—sal. salivary glands—sd. sd. ducts of the same—N. nerve collar—l.ot. left oculiferous tentacle—M. mouth—h.gl. hermaphrodite gland—alb. albumen gland—ovsp. ovisperm duct—ov. oviduct—sp. sperm duct—va. vagina—ds. dart sac—di. dilutant glands—spth. spermatheca—ap. appendix—pe. penis sheath—fl. flagellum.

FIG. 2.—In this diagram the nerve collar and chief nerves are shown. The oesophagus has been drawn forward and then cut through in front of the collar, while the buccal mass has been turned upwards and forwards so as to expose its ventral surface.

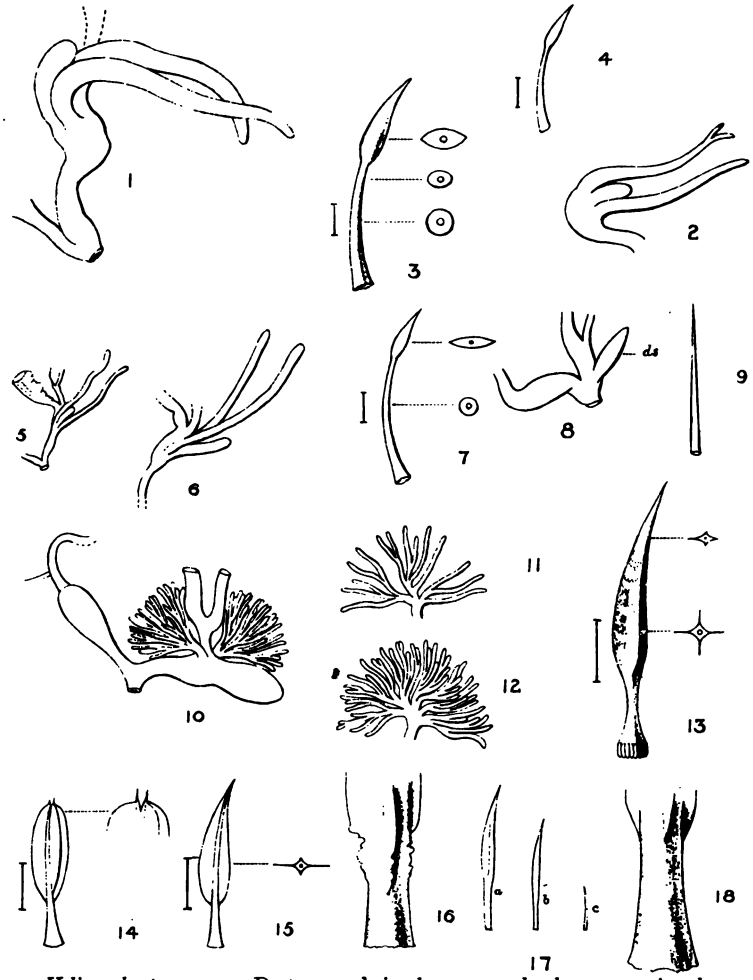
Cer. cerebral or supra-oesophageal ganglion pair, giving off a pair of nerves to the buccal ganglia (buc)—t^{I} t^{II} nerves from the cerebral ganglion to the great and small tentacles —inf. infra oesophageal ganglion—nn. nerves from the same to foot, &c.—R. SCHARFF.



Helix nemoralis L.—1, Dart-sac and mucous glands, nat. size. 2, Another example. 3, Dart in position enlarged. 4, Dart. 5, Base of dart more enlarged. 6, Immature dart, × 7.

Helix hortensis Müll.—7, Dart-sac, etc., nat. size. 8, One mucous gland of another example. 9, Dart. 10, Base of dart more enlarged. 10*a*, Flanged edge of blade cut transversely. 11, Immature dart, × 12.

Helix fusca Mont.—12, Bilobed dart-sac, × 4. 13, Dart, × 15. 14, Verticillate arrangement of mucous glands, × 10. 15, Dart in position.

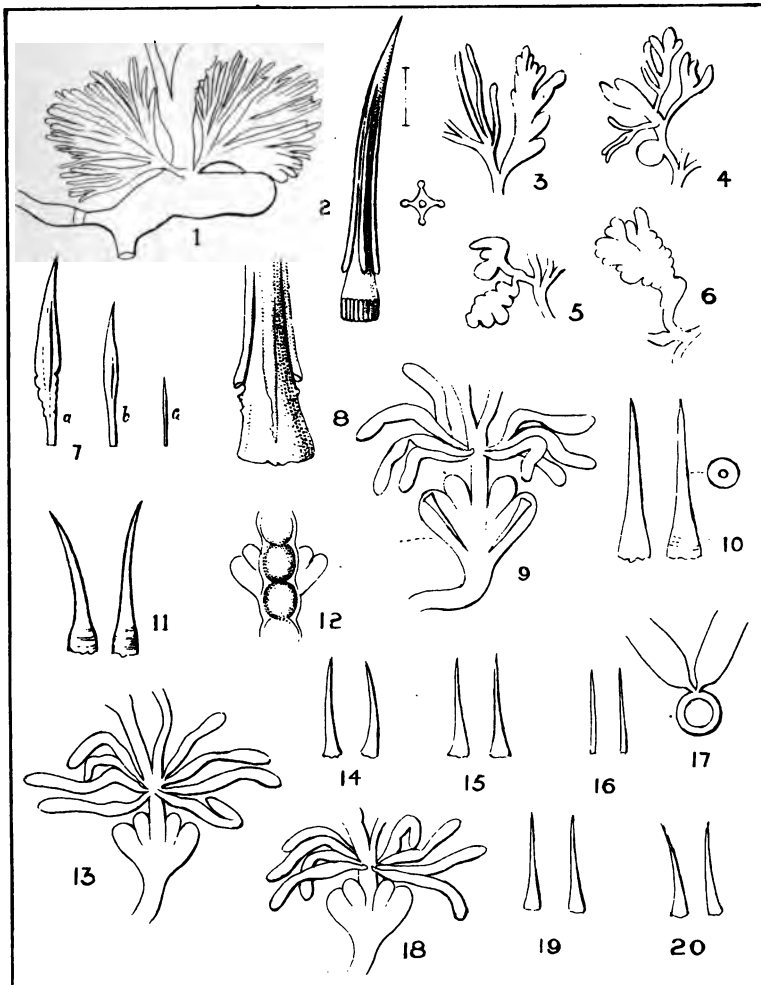


Helix arbustorum.—1, Dart-sac and simple mucous glands × 2. 2, Another example with bifid gland, nat. size. 3, Dart. 4, Dart not quite mature.

Helix lapicida.—5, Dart-sac and mucous glands, nat. size. 6, Another example enlarged. 7, Dart.

Helix pulchella.—8, Dart-sac, etc., × 35. 9, Dart, × 100.

Helix aspersa.—10, Dart-sac and multifid glands, nat. size. 11, Single gland with few branches. 12, Single gland unusually ramose. 13, Dart. 14, A malformed dart. 15, An abnormal dart. 16, Base of a dart approaching completion, much enlarged. 17, Young darts in three stages, × 3. 18, Base of mature dart, much enlarged.

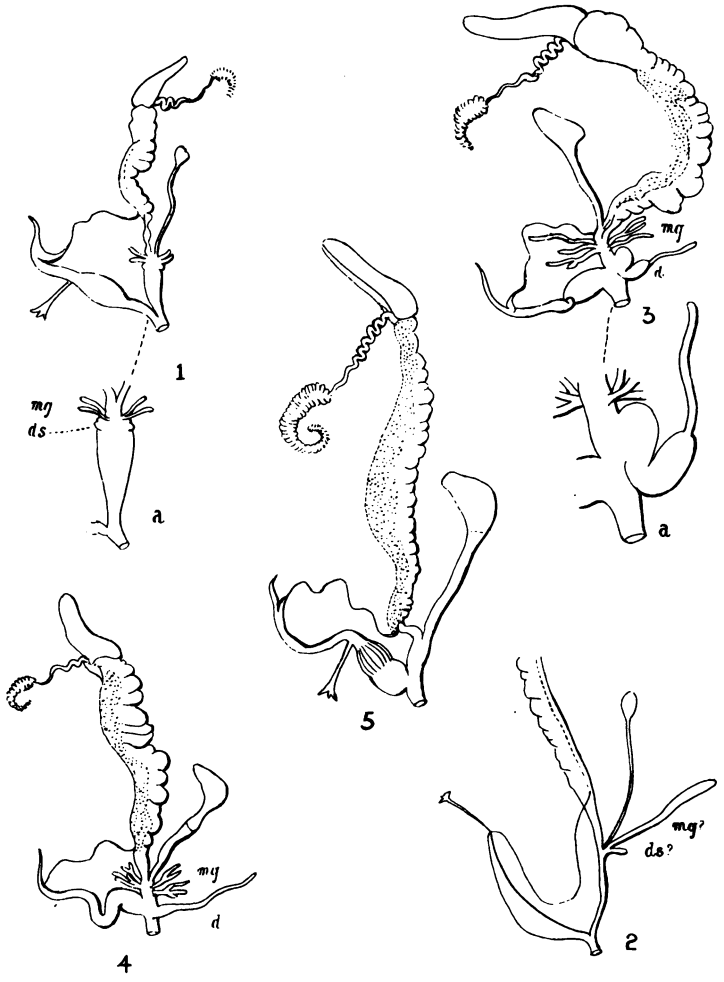


Helix pomatia.—1, Dart-sac and mucous glands natural size. 2, Dart. 3, 4, 5, 6, Abnormal growths of mucous glands. 7, Immature darts in three stages × 4. 8, Base of dart approaching completion.

Helix rufescens.—9, Pair of bilobed sacs much enlarged, the darts shown in position. 10, Pair of darts × 16. 11, Another pair. 12, Eggs passing between the dart-sacs.

Helix hispida.—13, Pair of bilobed dart-sacs much enlarged. 14, Pair of darts × 16. 15, Another pair. 16, Immature darts. 17, Union of mucous glands in pairs.

Helix concinna.—18, Pair of bilobed dart-sacs much enlarged. 19, Pair of darts × 16. 20, Another pair.



Reproductive Organs of—1 *Helix revelata* Mich. × 3, *a* mucous glands and rudimentary dart-sacs further enlarged ; 2 *Helix obvoluta* Müll. (after Schmidt) slightly enlarged, *mg ds* doubtful organs ; 3 *Helix Cartusiana* Müll. × 2, *d* doubtful organ, *a* same enlarged ; 4 *Helix Cantiana* Mont. slightly enlarged, *d* doubtful organ ; 5 *Helix sericea* Müll. (not Drap.) × 3, showing absence of accessory organs.

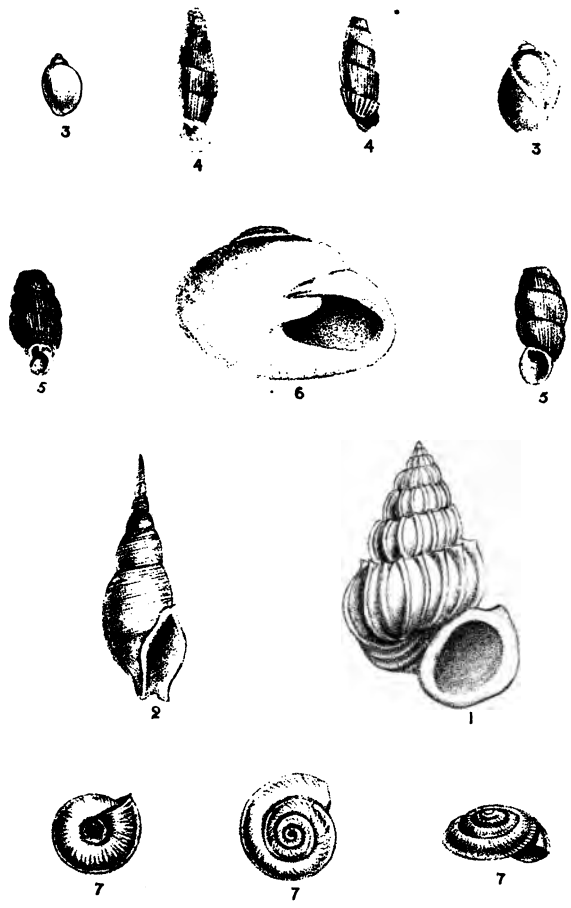
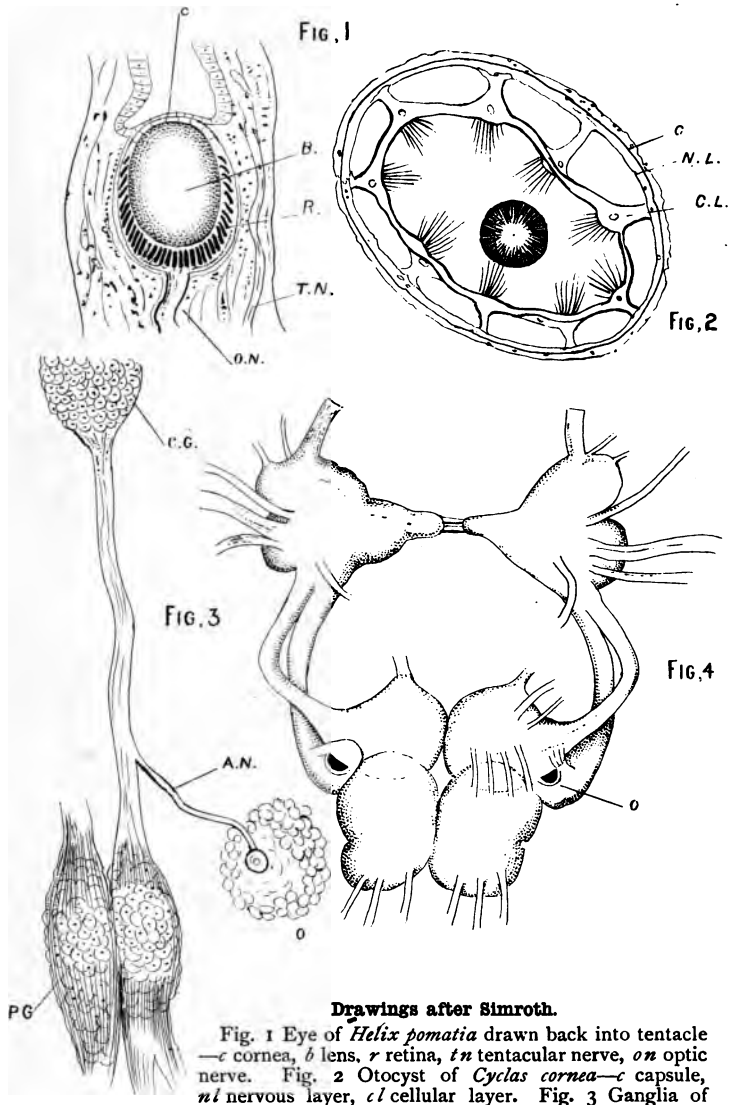


Fig. 1 *Scalaria inclyta* Melvill, n. sp. ; fig. 2 *Bullia pura* Melvill, n. sp. Fig. 3 *Physa melitensis* Mamo, pp. 230, 231 ; fig. 4 *Clausilia scalaris* Pfr., pp. 235, 236 ; fig. 5 *Clausilia mamotica* Gulia, p. 236 ; fig. 6 *Helix melitensis* Fer., p. 234 ; fig 7 *Helix Spratti* Pfr., p. 233.



Drawings after Simroth.

Fig. 1 Eye of *Helix pomatia* drawn back into tentacle —*c* cornea, *b* lens, *r* retina, *tn* tentacular nerve, *on* optic nerve. Fig. 2 Otocyst of *Cyclas cornea*—*c* capsule, *nl* nervous layer, *cl* cellular layer. Fig. 3 Ganglia of *Anodon* with otocyst—*cg* cerebral ganglion, *an* auditory nerve, *o* otocyst, *pg* pedal ganglion. Fig. 4 Nerve collar, showing auditory organs in *Helix hortensis*, (after Leydig)—*o* otocyst.

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109 Caithness	95 Elgin	81 Berwick
108 W. Sutherland	94 Banff	80 Roxburgh
107 E. Sutherland	93 N. Aberdeen	79 Selkirk
106 East Ross	92 S. Aberdeen	78 Peebles
105 West Ross	91 Kincardine	77 Lanark
104 North Ebudes	90 Forfar	76 Renfrew
103 Mid Ebudes	89 East Perth	75 Ayr
102 South Ebudes	88 Mid Perth	74 Wigton
101 Cantire	87 W. Perth & Clckm	73 Kirkcudbright
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99 Dumbarton	85 Fife & Kinross	

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